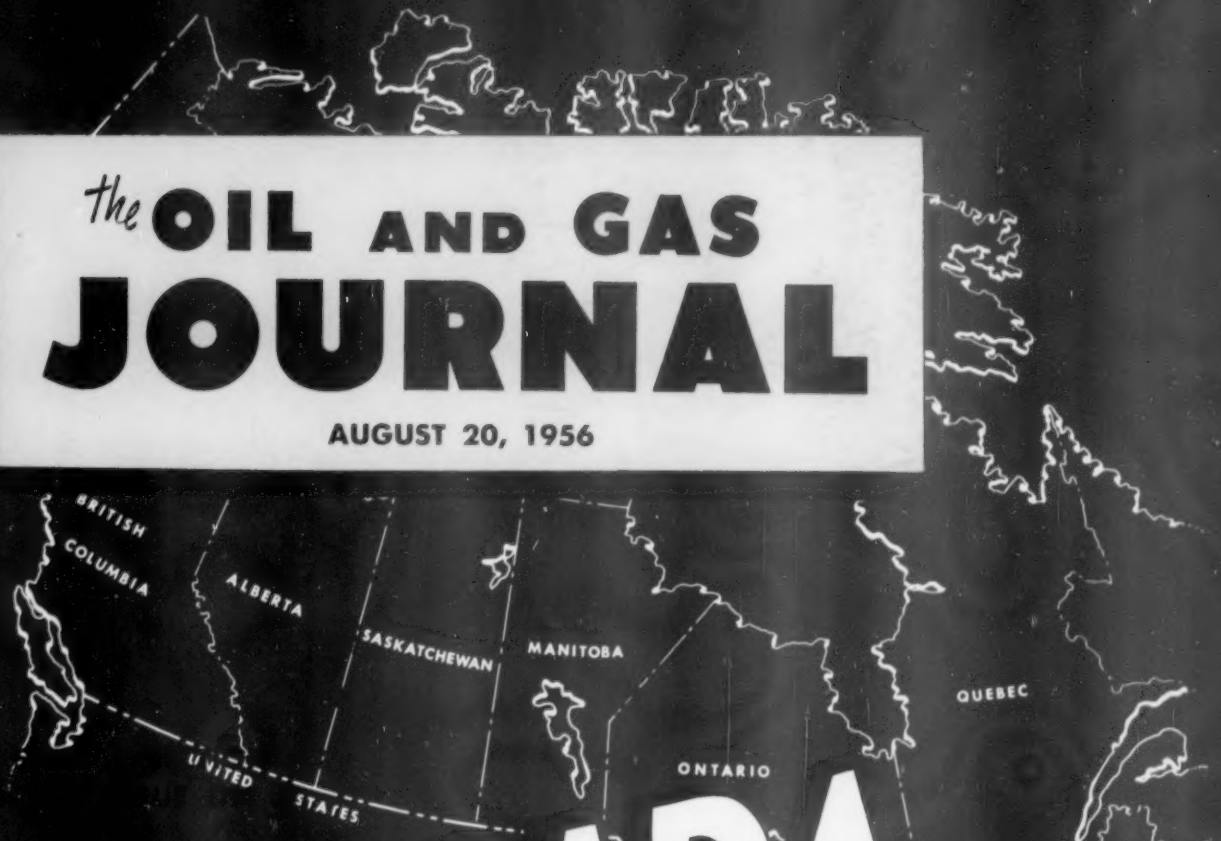
the OIL AND GAS JOURNAL

AUGUST 20, 1956



CANADA

. . . where oil is king

Field and reservoir data

Map of oil and gas fields

plus . . .

Exclusive articles on all phases of operation.

section starts on page 123

Ratable-Take Ideas Pay Off in Texas Gas Fields. p. 96

Sharp Curves? Yes! Detailed Curves? Yes! Clear Curves? Yes! *And, above all—*

REPEATABLE CURVES!

In the more than 80 thousand Lane-Wells well logging jobs, operators have found that Lane-Wells Radioactivity Well Logging gives them complete, accurate, *dependable* down-hole information. For, in well after well, it has been proved that Lane-Wells highly developed instrumentation produces *highly repeatable* curves—Gamma Ray and Neutron *both*.

And with Lane-Wells *DUALIZED* Well Logging Service you get *both* Gamma Ray and Neutron Curves on *one run* . . . plus a Collar Log to pinpoint all future down-hole work!

Write for complete information, and remember

You get the BEST in service when you call

Tomorrow's Tools Today!

LANE WELLS COMPANY

General Offices, Export Office, Plant • 5610 So. Soto St., Los Angeles 58

LOS ANGELES • HOUSTON • OKLAHOMA CITY • LANE-WELLS CANADIAN CO. IN CANADA • PETRO-TECH SERVICE CO. IN VENEZUELA

A Glance Ahead . . . . at press time

These trends will make TOMORROW'S NEWS

Cryptic ads in the metropolitan New York papers ask: What's with the white pump? The answer: Wait 'til August 21. It's the tipoff that Shell will be marketing its new superpremium grade in New York City, Long Island, Westchester, New Jersey, and parts of Delaware and eastern Pennsylvania by that date.

Next on the schedule is the Albany area, including upstate New York. By mid-autumn Shell expects to have its new high-octane grade moving in all Eastern Seaboard states from Maine to Florida. Beyond that the company isn't saying—yet.

The first of the Guatemala concessions sought by 22 companies may be certified around September 1. Signal Exploration Co. won the only uncontested block. With overlaps ironed out, the government has only to process the applications and approve titles to acreage.

Drilling is expected to start before the year is out in the rank wildcat country where a jungle test well is expected to cost $1,000,000 to $2,000,000.

Now in private hands, synthetic rubber is showing real bounce. The companies which purchased government facilities over a year ago have revealed plans to boost basic rubber capacity 37 per cent by 1957.

The oil business is sharing in this boom, but is losing ground to the rubber and chemical companies in new planned expansion. Through outright ownership and interests in joint operations, oil companies controlled about 36 per cent of all capacity a year ago. Although they're adding new facilities, they will have only 32 per cent when projects now announced are completed.

There'll be no problem in keeping tabs on product imports from Puerto Rico, which are expected to start soon.

Any shipments to continental United States will be included in the import totals published by the Bureau of Mines. Since imports tabulated by the Commerce Department will not include these shipments, the volume can be calculated by comparing the two sets of figures.

The lube-oil market, which has had its ups and downs in recent years, is presently very strong, and many refiners are boosting their processing schedules on the better crudes for lube manufacture.

The long-range picture isn't as rosy however, and it's doubtful that the present tight situation will lead to construction of much new capacity. Exports are still off and not expected to improve much, and the gas turbine still hangs as a possible threat to future demand of crankcase oils presently enjoying a bumper demand.

A plus for companies now investing in third-grade gasoline pumps is seen down the road when—and if—the gas turbine becomes an important automotive factor.

The segregated facilities for the third grade will make room for marketing two gasoline grades plus a gas turbine fuel. This may well have been a factor in some companies' decision to spend the money on third grade distribution now.

The OIL AND GAS JOURNAL

AUGUST 20, 1956 • VOLUME 54 • NUMBER 68

THE STAFF

TULSA OFFICE
211 South Cheyenne Ave
Phone Diamond 3-6291

Kenneth B. Barnes — Editor
Henry D. Ralph — Chief Editorial Writer
Ted A. Armstrong — News Editor
Gerald L. Farrar — Engineering Editor
Dr. Frank J. Gardner — Exploration Editor
Paul Reed — Pipeline Editor
John C. Reidel — Petrochemical Editor
C. O. Willson — Consulting Editor
W. L. Nelson — Technical Editor
Lynn M. Nichols — Presentation Editor
John C. Casper — Economics Editor
Neil Williams — Associate Editor
Harman S. Morrisey — Drilling Development Editor
Robert G. Deering — Associate Pipeline Editor
R. B. Tuttle — Equipment Editor
Bill Linville — Assistant to Presentation Editor
Carl Hoot — District Editor
Carl J. Lawrence — District Editor
John C. McCaslin — District Editor
W. A. Bachman — District Editor
Gene T. Kinney — District Editor
J. O. Scott — District Editor
J. C. Bradford — District Editor
LaWanda Turner — Readership Research
Helen Brown — Editorial Assistant
Alice Burt — Editorial Assistant
Ailleen Cantrell — Editorial Assistant
C. Dudley Johnston — Art Director
Jo Jeanne Speaker — Staff Artist

NEW YORK OFFICE
500 Fifth Avenue
Phone LOngacre 4-6160

George H. Weber — Refining Editor
Paul Swain — International Editor
Ray G. Gibson — District Editor

HOUSTON OFFICE
802 Sterling Building
Phone CApitol 4-7726

Larry Reser — District Editor
Ed McGhee — District Editor
Joe Reilly — District Editor

DALLAS OFFICE
1238 Mercantile Bank Building
Phone STerling 3074

Robert J. Enright — District Editor

LOS ANGELES OFFICE
650 South Grand Avenue
Phone VAndike 0722

D. H. Stormont — District Editor
William T. Smith — District Editor

WASHINGTON OFFICE
621 Albee Building
Phone District 7-1710

Bertram F. Linz — District Editor

Correspondents at Denver, Pittsburgh, Calgary, Columbus, Ashland, Ky., Oil City, Pa., Mount Pleasant, Mich. Melbourne, Australia; Regina, Sask.; Chatham, Ont.; Casper, Wyo., and Anchorage, Alaska.

The Oil and Gas Journal, Published Mondays, copyright 1956, by The Petroleum Publishing Co. Entered as second-class matter September 1, 1910, at post office at Tulsa, Okla., under act of March 3, 1879. United States and foreign rates to the petroleum industry, 1 year $4, 2 years $7, 3 years $8

IN THE NEWS

General Interest:

Oil Industry Prepares for the Worst in Suez Crisis 100
California Refiners Step Up Crude Imports 103
Offshore Barge Capsizes, Salvage Attempt Due 107
June Crude-Oil Imports Set All-Time Record 108
Justice Department Closes Onassis Tanker Case 112
Penn Grade Crude Prices Increased Again 112
Sinclair Buys Interest in Texas Pacific Coal & Oil 115
New Tanker Champion Crowned in Japanese Yards 122
Iran Offers Its Royalty Crude to Highest Bidder 122

Processing:

First Crude Arrives at Big, New Tidewater Refinery 98
Richfield Solves Smog Problem at California Plant 107
Texas Butadiene's New Plant Begins to Take Shape 111
U.O.P. Agent Accused of Favoritism by Filtrol Corp. 112
Processing Briefs 115
Table Models Pave Way for Big Dutch Refinery 121

Exploration:

Navajos Try to Revive Exclusive Deal with Delhi-Taylor 106
British-American Stakes Salt-Dome Confirmation Test 107
Sweet Canadian Deal Turns Sour for Orville Parker 111
Cuban Strike Completed for Only 30 Bbl. Per Day 116
U. S. Firm Plans Test on Panama Concession 119
Stepped-Up Exploration Due Soon in Colombia 119
British Columbia Has High Success Ratio 279
Western Canada Drilling Up 10 Per Cent 282

Production:

New Texas Gas-Proration Plans Have Early Success 96
Humble Proposes Flood for Raccoon Bend Field 98
Hydrafrac Case Settled; Stanolind Receives Big Sum 102
Louisiana Cuts Allowable for Offshore Oil Wells 102
Three Producing Days Asked for Headlee Field 106
Texas to Drop Hearings on Exempt Status of Fields 115
Russia Claims Output of 1,590,000 Bbl. Daily 116

Pipelines:

Westcoast Gas Line Makes Up for Lost Time in Canada 103
Trans-Canada Races with Winter Toward Winnipeg 104

Government:

U.S-Louisiana Officials Reported Near Offshore Accord 99
Senate Probe of Depletion Allowance Seen Next Year 102

OIL AND GAS PIPELINES • REFINING • PETROCHEMICALS
EXPLORATION • DRILLING • PRODUCTION • FIELD PROCESSING

. . . an integrated magazine serving an integrated industry

SPECIAL CANADIAN SECTION

Journal Tech Report **123**

A nine-page tabulation of Canadian oil and gas fields showing fundamental field and reservoir characteristics—plus a four-page foldout map of western Canadian provinces.

Best Results From Diamond Coring **132**
By A. G. G. de Chastelain

Pressure Maintenance by Water Flood **136**
By W. E. Perkes

Dollard oil field profits from early planning.

Fluid Fracturing Boosts Manitoba Activity **142**
By W. Weiner

Savanna Creek May Rival Pincher Creek **149**
By Joseph S. Irwin

Drilling Surges in Southeastern Saskatchewan **155**
By Norman S. Morrisey

Southern Saskatchewan Makes Big Plans **156**
By P. F. Brennan and R. R. Graves

A geological summary of Canada's most active wildcat area.

Cable Tools Drill Offshore **166**
By P. S. Bazett

Offshore operations in Lake Erie are developing substantial gas reserves.

D.S.T. Canada—Current Trends and Equipment **173**
By R. A. Pitman and A. R. Potter

How Pembina Beats Weather Problem **187**
By F. A. Madill and K. M. McMillan

How Pembina Pipe Line, Ltd., solved some peculiar pipeline problems.

Redesign Reduces Bit-Tooth Breakage **191**
By James E. Sayers

Power-Drilling Sub Whips Diamond-Coring Problems **194**
By E. M. Blanchard

Canadian Refineries Pass U.S. Cat Processing Percentage **201**
By George Weber

Canada's First Big-Inch Gas Pipeline **205**
By Charles H. Hetherington and D. I. Pflug

Gravity—An Accurate Exploration Tool **210**
By W. F. Stackler

Gravitational prospecting in the foothills of Alberta offers excellent possibilities.

Petrochemicals on March in Canada **217**
By John C. Reidel

Biological Oxidation of Phenolic Waste Water **223**
By Alex D. McRae, William K. Ross, and Alan A. Sheppard

Petrofina Refinery Operates Economically **229**
By R. Donald Hickey

A description of the economical operations in a major Montreal refinery.

Canadian Octanes Approach United States Levels **234**
By J. A. Nevison and H. R. Crane

Octanes of Canadian premium gasoline continue to rise sharply.

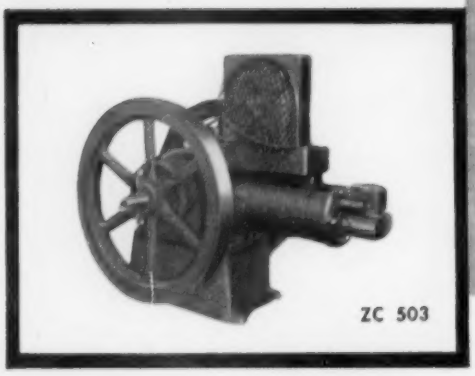
TECHNOLOGY—OPERATION

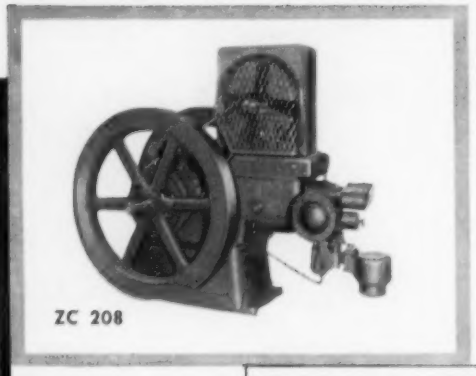
Questions on Technology **241**

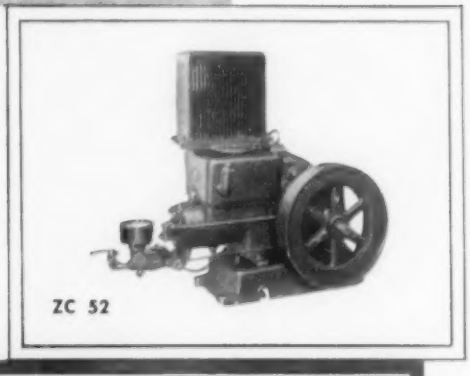
Pipeline Patrol—Construction **243**

DEPARTMENTS

A Glance Ahead	**1**	Books	**214**	Statistical Summary	**307**
They Say	**81**	Pipeline Patrol	**243**	Drilling Statistics	**308**
Calendar of Events	**88**	Drilling Contractors	**251**	Supply Statistics	**309**
Journally Speaking	**91**	Equipment Digest	**257**	Refining Statistics	**310**
Editorial	**93**	Equipment Men in News	**273**	Markets	**311**
This Week	**95**	Exploration Highlights	**279-316**	Classified Advertising	**312**
International News	**116**	Personals	**304**	Advertisers' Index	**317**


ZC 503


ZC 208

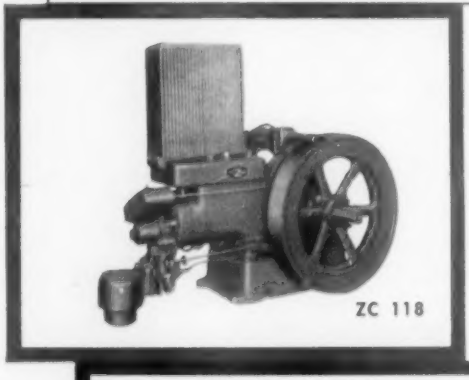

ZC 52

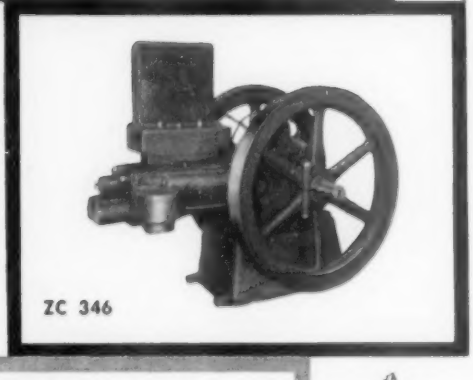
pick a "ZC" that best fits your pumping unit!

The broad Fairbanks-Morse "ZC" line has an engine that will best fit your pumping unit . . . from 3 to 30 hp. They're economical and easy to maintain—simply designed with no complicated parts or delicate adjustments.

All "ZC" sizes are high displacement, heavy-duty, slow-speed models—ideal for oil field pumping service! And, all sizes have the famous extra-heavy double flywheel for symmetry and perfect balance . . . with power take-off on either side of the engine.

See your local supply store about the "ZC" line . . . or write Fairbanks, Morse & Co., Chicago 5, Illinois.


ZC 118

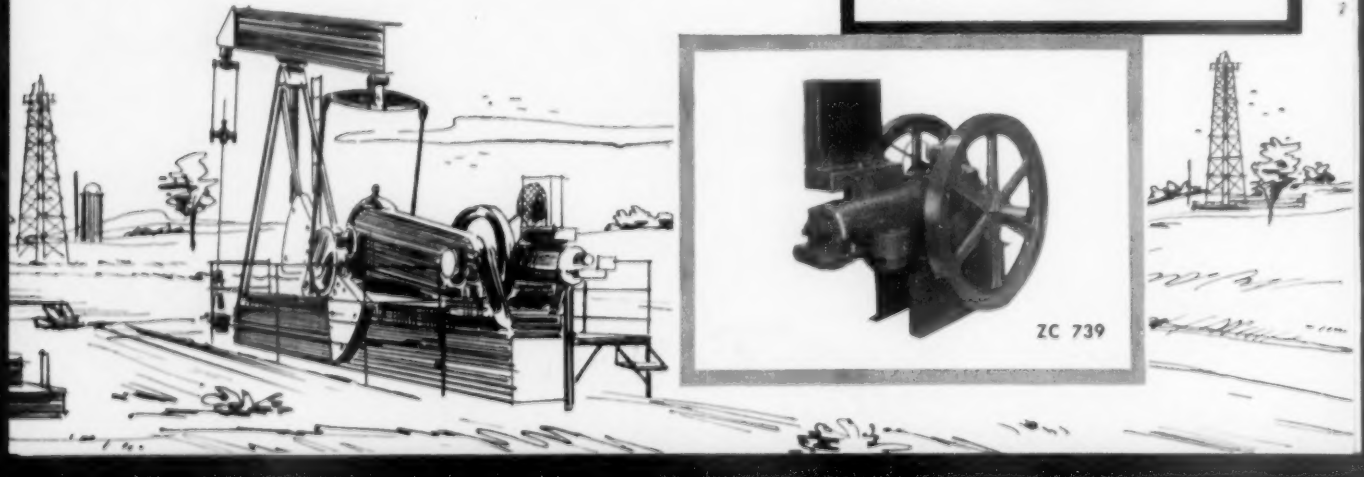

ZC 346

FAIRBANKS-MORSE

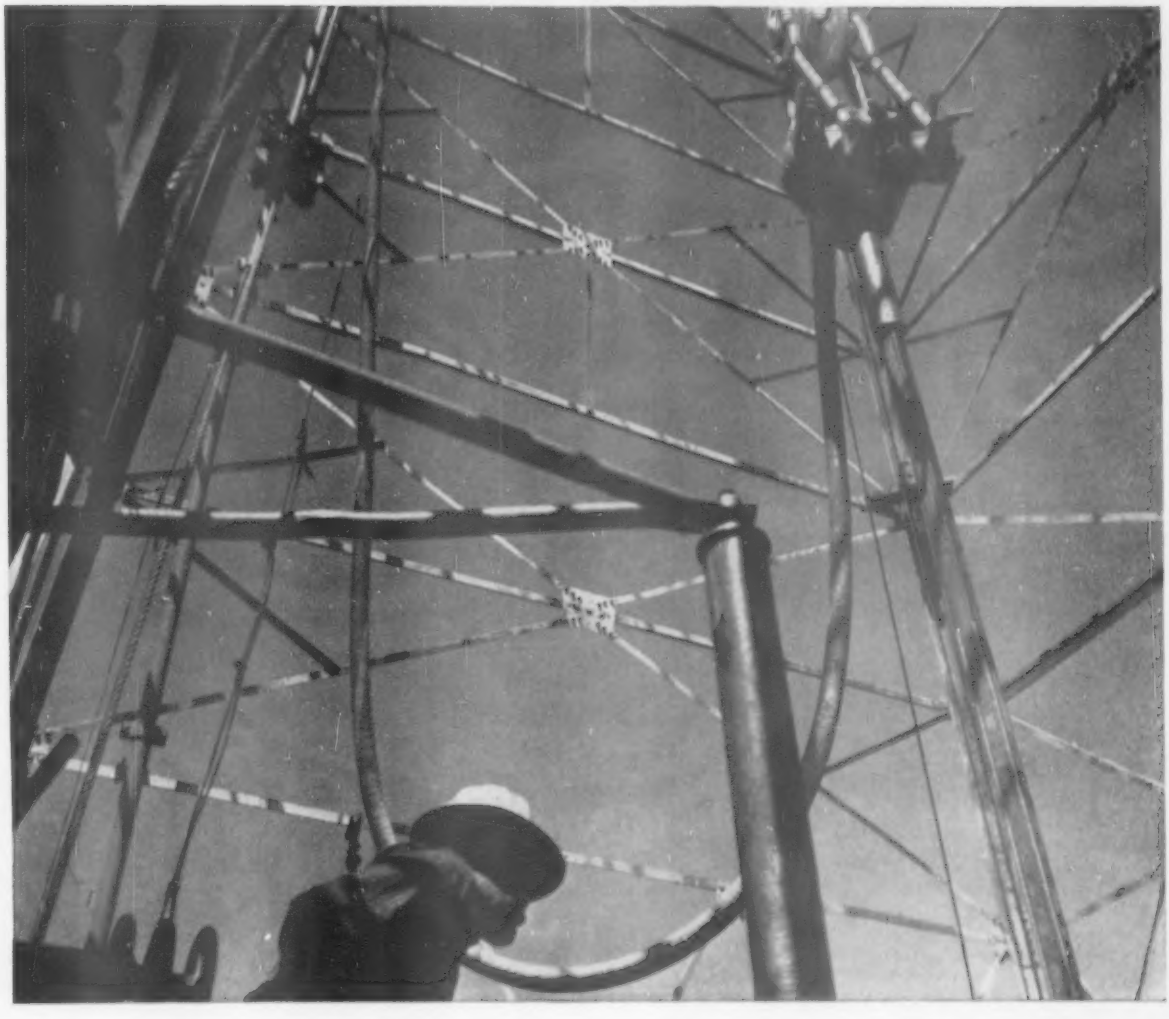
a name worth remembering when you want the best

OIL FIELD EQUIPMENT • PUMPS • SCALES • GENERATORS
ELECTRIC MOTORS • LIGHT PLANTS • DIESEL, DUAL FUEL & GASOLINE ENGINES • MAGNETOS • DIESEL LOCOMOTIVES

ZC 739



B.F.Goodrich



No danger of burst with B. F. Goodrich rotary drilling hose

B. F. Goodrich builds a rotary drilling hose you can put out of your mind when you put it on your rig. No more worries about hose blowouts, shutdown time, damage to drilling bit or rig, or possible injury to the crew. Here's the story—inside and out—on this stronger, longer-lasting Highflex rotary drilling hose.

Spiral-wrapped cable wires make it resistant to bursts, qualify it for Grade C (5000 lb. test pressure) American Petroleum Institute. Hose ends are reinforced with additional plies of wire and fabric to protect against bending stress at the couplings. Extra strength here means extra safety for your crew and rig—no hose blowouts at the coupling.

Strong as it is, B. F. Goodrich Highflex is still the most flexible hose made for heavy-duty service. It's easy to attach to the rig, hangs well from the standpipe, coils easily without kinking.

The thick, tough cover on Highflex resists gouges, scrapes, tears. Sun, wind and rain will not weaken it. Oily mud will not cause swelling or rotting of the tube.

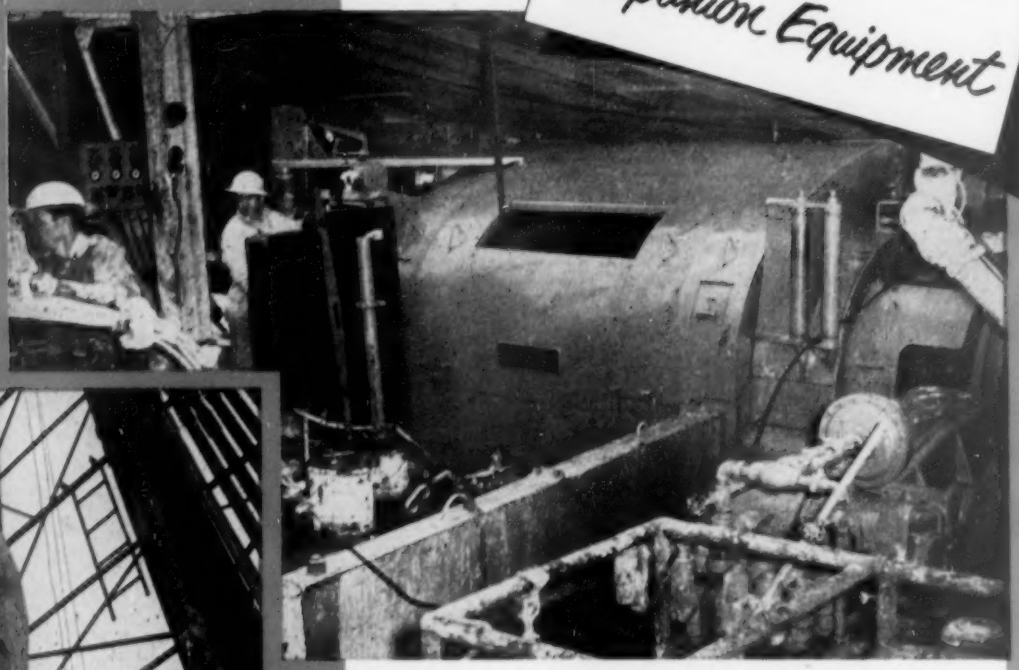
You'll find B. F. Goodrich Highflex hose at leading supply stores in the oil field, or at any of these B. F. Goodrich warehouses: Los Angeles, Great Bend, New Orleans, Hobbs, Oklahoma City, Tulsa, Dallas, Houston, Odessa, Wichita Falls. *B. F. Goodrich Industrial Products Company, Dept. M-734, Akron 18, Ohio.*

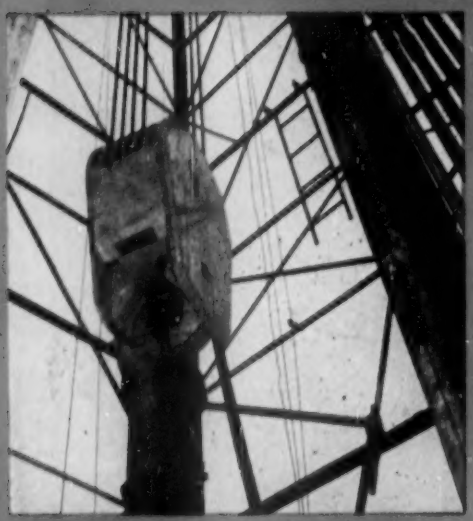
B.F.Goodrich

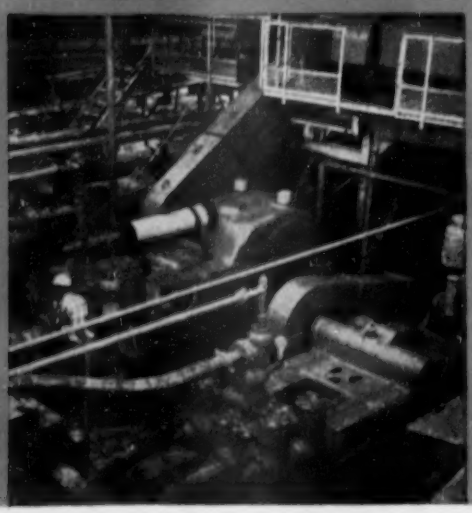
INDUSTRIAL PRODUCTS

This is the Rig...

"Oilwells" No. 96 with Companion Equipment







...for drilling the "deep ones"

THIS "Oilwell" No. 96 Draw Works with No. 1,500 four-engine drive was used by Shell Oil Company for their 16,415 ft. producing well recently drilled on Cote Blanche Island on the Gulf Coast.

An "Oilwell" No. 15 Automatic Drilling Control regulated the feed-off from the Draw Works and is shown at the extreme right. Two No. 818-P Slush Pumps were driven from the compound and furnished the mud for jet-bit drilling. A separate engine-driven No. 212-P Pump was used for mud mixing.

No. 580 Crown Block and No. 480 Traveling Block provided for twelve-line reeving when casing strings of approximately 500,000 lbs. were run.

The farther you operate from established service centers, the more you benefit from the extra "safety margins" that are built into every piece of "Oilwell" drilling equipment.

OIL WELL SUPPLY
DIVISION
UNITED STATES STEEL CORPORATION

Executive Offices—DALLAS, TEXAS
Export Office—
30 ROCKEFELLER PLAZA
NEW YORK 20, N. Y.

Area Offices— CALGARY, CANADA
CASPER, WYOMING....COLUMBUS, O.
DALLAS, TEXAS....HOUSTON, TEXAS
TULSA, OKLA...LOS ANGELES, CALIF.

Branches Serving All Oil Fields

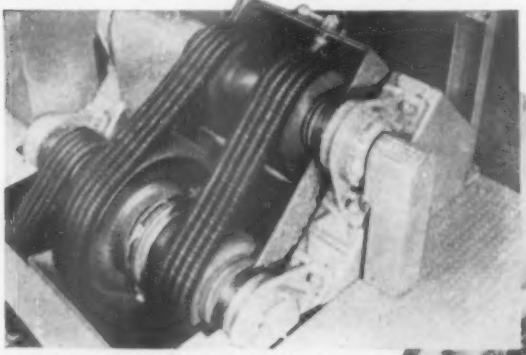
USS

"OILWELL"

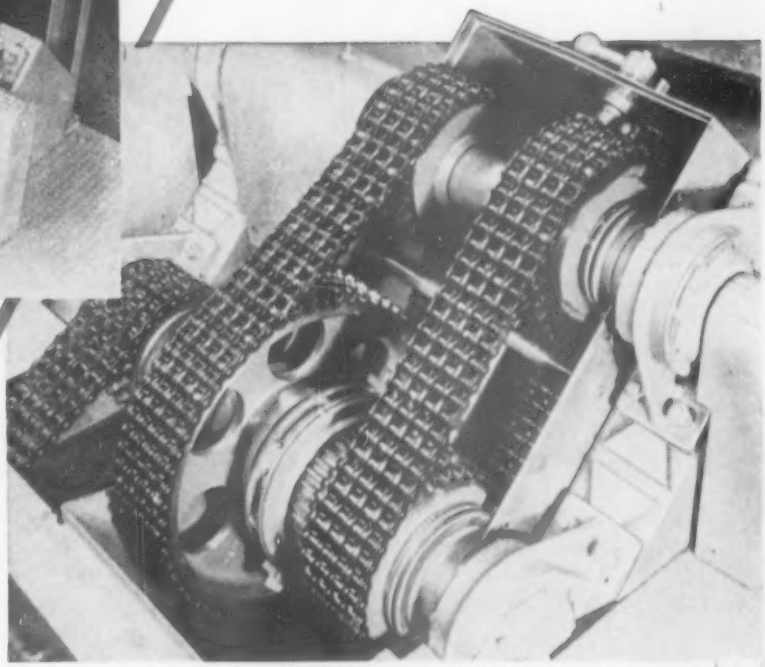
TRADE MARK

UNITED STATES STEEL

It's not just static strength...



RESISTANCE TO TENSILE STRESS is achieved by use of properly heat-treated, accurately-machined sidebars made of premium steel and fitted with properly-hardened pins, bushings and rollers. But to resist *operational* stresses, additional controls over dimensional accuracy, uniformity and roller resiliency are essential.



STRENGTH OF CHAIN IN MOTION is accomplished through tensile strength *plus* special Link-Belt refinements. These include pitch-hole preparation, micro-finish of parts, special processing of sidebars, prelubrication and rigid quality control from initial selection of materials to final protective boxing. It means longer chain life on this two-speed pump drive of 5-section drive group on National Supply Company's No. 160 rig.

it's *dynamic strength*

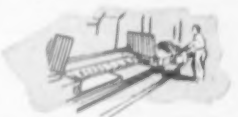
in LINK-BELT Roller Chain that fights fatigue

Serving on modern high-powered oil field equipment, the components of every pitch of roller chain face severe and repeated operating stresses—engagement with sprockets, shock of starting loads, centrifugal loads and others. That's why dynamic strength—ability of chain to resist these stresses—is so important. And it's built into every length of Link-Belt Precision Steel Roller Chain.

How is dynamic strength achieved? In addition to Link-Belt "extras" . . . special design, manufacturing and processing steps provide required properties of uniformity and accuracy for long-life operation.

Talk over your roller chain needs at your nearby Link-Belt office or any leading supply store in the field. Ask for Book 2680, covering this complete line of single and multiple widths up to 3-inch pitch. 14.324

LINK-BELT gives you dynamic strength that comes from these important EXTRAS



PRE-STRESSING of multiple width chain provides uniform load distribution

SHOT-PEENED ROLLERS have greater fatigue life, added ability to withstand impact.

SHEPHERD'S CROOK COTTERS will remain in place under severe operating conditions

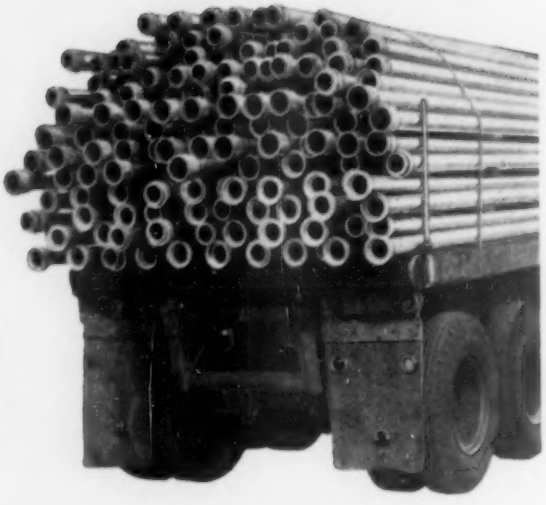
FASTER COUPLING and uncoupling of multiple width chain with E-Z Assembly feature.

LINK-BELT

ROLLER CHAINS & SPROCKETS

LINK-BELT COMPANY: Indianapolis 6, Houston 1, Dallas 21, Odessa, Tex., Shreveport, La., Los Angeles 33, Scarboro (Toronto 13); Export Office, New York 7. Distributors in All Fields.

AMAZING ECONOMIES
WITH KAISER ALUMINUM PIPE!



FULL MILE OF PIPE CARRIED ON ONE TRUCK! The truck shown has a maximum load limit of 18,000 pounds—yet is loaded with 176 lengths of 30-foot, 4-inch Kaiser Aluminum Petroleum Pipe! Total pipe weight is less than 5,500 pounds—well within the load limit. Total pipe footage—one full mile! A similar length of steel line pipe would require more than three trucks. *Kaiser Aluminum pipe cuts the cost of hauling by at least two-thirds!*

10 TIMES EASIER TO HANDLE THAN STEEL PIPE! As shown below, 30 feet of 4-inch Kaiser Aluminum petroleum pipe is *easily* handled by only one man—because it's more than 10 times lighter than steel pipe. But 25 feet of 4-inch steel pipe is a heavy load for four men. Light weight of Kaiser Aluminum pipe results in *savings up to $84.35 per mile for loading, stringing, and pickup!*

CONNECTS 14 TIMES FASTER THAN STEEL PIPE! Only one or two men with light tools are needed to connect Kaiser Aluminum 4-inch petroleum pipe, using new quick connecting aluminum couplers. With T&C steel pipe, three or four men with heavy tools are required. *Savings for connecting and disconnecting alone are as much as $135.48 per mile!*

Obviously, the savings possible with Kaiser Aluminum petroleum pipe are enormous! So see your supplier now. He stocks Kaiser Aluminum petroleum pipe in 30-foot lengths of 2, 3, and 4 inch diameters, with cladded inside surfaces to provide increased resistance to corrosion. He also has couplers and other fittings to complete your system.

For further information on the pipe, fittings and tools, contact the Kaiser Aluminum sales office listed in your telephone directory.* Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Building, Chicago 11, Illinois; *Executive Office,* Kaiser Building, Oakland 12, California.

* **Information may also be obtained from the following suppliers:**

REPUBLIC SUPPLY COMPANY
Republic Building (Home Office)
Oklahoma City, Oklahoma

DUNIGAN TOOL & SUPPLY CO.
1534 South Treadaway
(Home Office)
Abilene, Texas

Kaiser Aluminum

"Speed and versatility cut pipe-pushing costs"

says Allied Gas Company

If light pipelaying work is on your schedule, get the facts now about the Oliver OC-3!

Here's the little tractor properly sized for the job—available with hydraulic side boom, rear towing winch, front-mounted backfill blade and pipe bending shoe. With "Little Boomer" you're set to handle all kinds of jobs along the pipelines—at less cost—and without tying up larger, more expensive equipment.

The Allied Gas Company of Paxton, Illinois, is a case in point. Since purchasing their "Little Boomer" in September, 1955, they've kept it busy grading and backfilling, winching, bending 3" and 4" pipe and lowering in. They can't say enough for its easy handling and versatility.

With a total weight of only 5205 pounds, the OC-3 provides a lifting capacity of 2000 pounds at a boom angle of 70°—handles laying and lowering operations on pipelines up to 6"—carries 40' lengths of 12" pipe—unloads and transports pipe—and is ready to move other equipment, too. Operation is simple, performance dependable. Compact size and differential steering give it unexcelled maneuvering in close quarters.

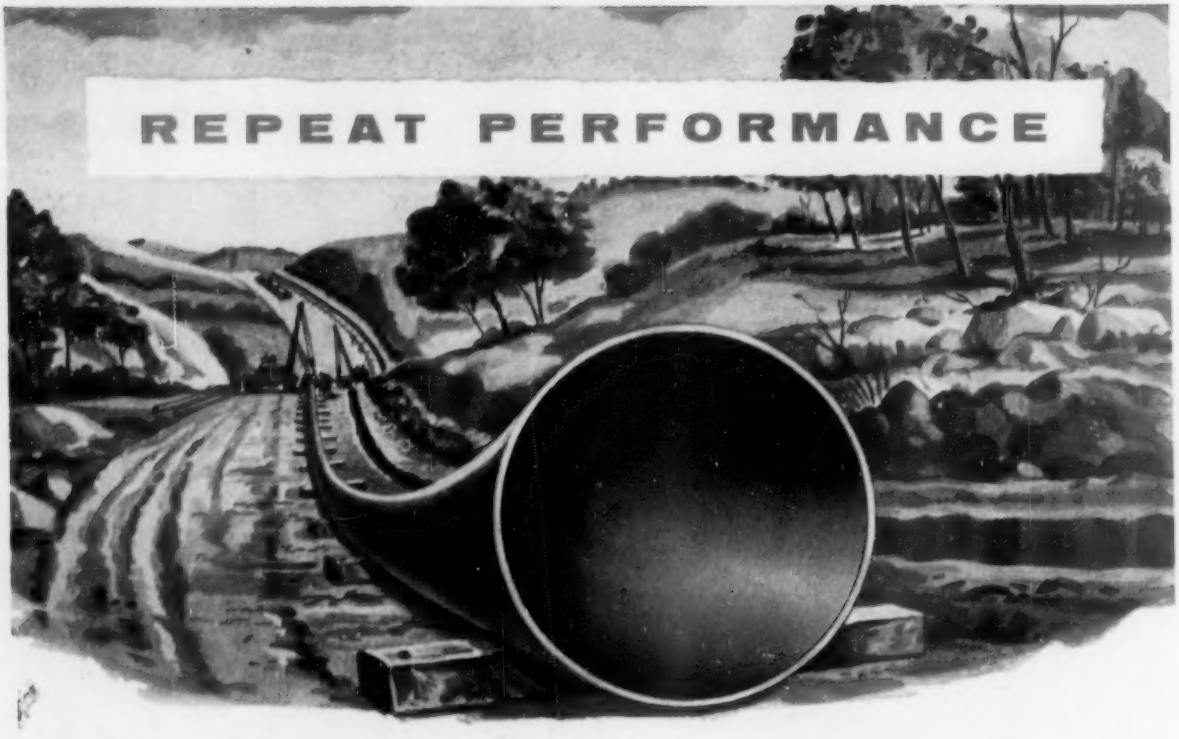
This new bulletin has the information you want—with application photos, specifications, etc. Ask your Oliver distributor for your copy or write us for Bulletin A-1042.

THE OLIVER CORPORATION

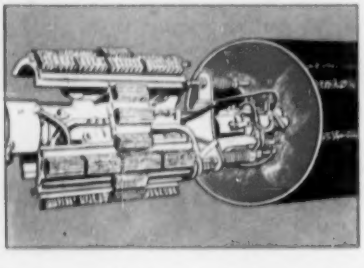
400 West Madison Street, Chicago 6, Illinois

OLIVER

A COMPLETE LINE OF INDUSTRIAL WHEEL AND CRAWLER TRACTORS AND MATCHED ALLIED EQUIPMENT



Copon internal pipe coating selected again by major gas transmission company



Thirty and thirty-six inch pipe being automatically spray-painted at mill following unique metal cleaning process.

Proof of COPON'S effectiveness in solving internal pipe coating problems lies in its growing acceptance by major gas transmission companies. This year it's being used again by one leading firm for new 30" and 36" pipeline construction in addition to many other projects.

COPON internal pipe coatings offer *even more* than outstanding protection against corrosion losses. They *pay off* in protection during storage, lowered maintenance expense and greatly reduced pigging costs. And COPON coatings make possible delivery of cleaner, rust-free gas products.

Scientifically developed systems are available for coating dehydrated gas lines, crude and petroleum product lines, salt water lines, fresh water lines, and oil well tubing and casing. Write your nearest COPON manufacturer today. He will be happy to show you how COPON can be efficiently applied to new pipe, used pipe or pipe-in-ground.

Get complete information about COPON today.

MAIL COUPON TODAY OGJ 8

Please send me information about COPON Internal Pipe Coatings.

Name_____

Company_____

Position_____

Address_____

City_____ State_____

ALLIED PAINT MFG. COMPANY
P. O. Box 1088, Tulsa, Okla.

BENNETT'S
65 W. First South St.,
Salt Lake City 10, Utah

WALTER N. BOYSEN CO.
42nd & Linden Sts., Oakland 8, Calif.
2309 E. 15th St., Los Angeles, Calif.

BRITISH AMERICAN PAINT CO., LTD.
P. O. Box 70, Victoria, B. C., Canada

BROOKLYN PAINT & VARNISH CO., INC.
50 Jay Street, Brooklyn 1, N. Y.

COAST PAINT & LACQUER CO.
P. O. Box 1113, Houston 1, Texas

ENTERPRISE PAINT MANUFACTURING CO.
2841 S. Ashland Ave., Chicago 8, Ill.

HANNA PAINT CO., INC.
P. O. Box 3206, S. H. Station,
Birmingham 5, Ala.

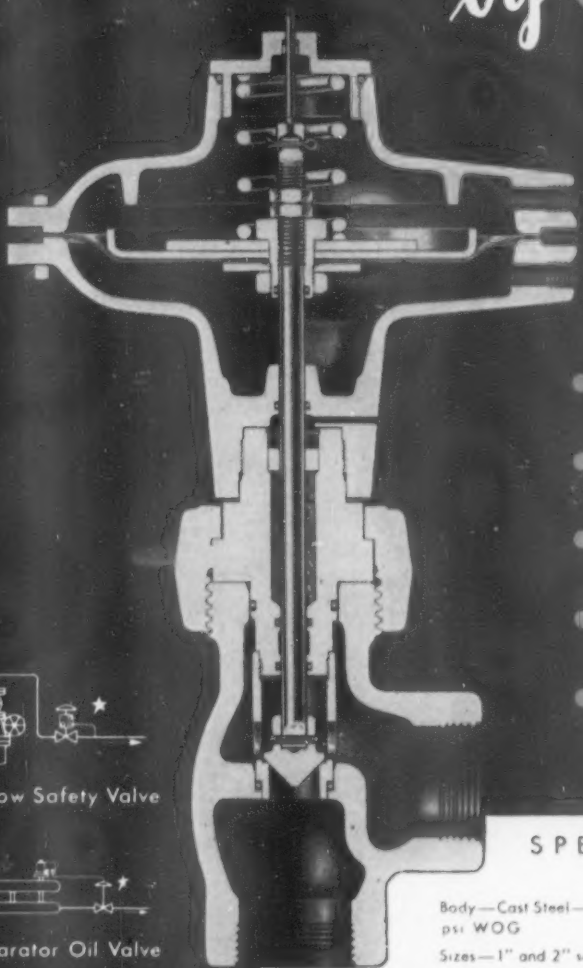
KOHLER-McLISTER PAINT CO.
P. O. Box 546, Denver 1, Colo.

JAMES B. SIPE and COMPANY, INC.
P. O. Box 8010, Pittsburgh 16, Pa.

A New FIELD VALVE by FISHER®

Series 125P

HIGH PRESSURE DIAPHRAGM CONTROL VALVE



- RUGGED CAST STEEL BODY GOOD FOR 2000 psi PRESSURE
- ONE INNER VALVE FITS ALL ORIFICES
- TOPWORKS INTERCHANGEABLE ON ALL BODIES
- DIAPHRAGM CASINGS SUITABLE FOR 50 psi OPERATING PRESSURE
- TOPWORK ACTION REVERSIBLE WITH NO ADDITIONAL PARTS

WRITE FOR BULLETIN O-125P

Hi-Low Safety Valve

Separator Oil Valve

Time Cycle Intermitter

SPECIFICATIONS

Body—Cast Steel—2000 psi WOG

Sizes—1" and 2" screwed angle or globe

Orifice Size—1" Body—¼", ⅜", ½", ¾" 2" Body—¼", ⅜" ½", ¾", 1"

Valve Cage—440 hardened St. Steel. (Tungsten carbide insert also available.)

Inner Valve—440 hardened St. Steel (Tungsten carbide tip also available.)

FISHER GOVERNOR COMPANY

MARSHALLTOWN, IOWA · WOODSTOCK, ONTARIO

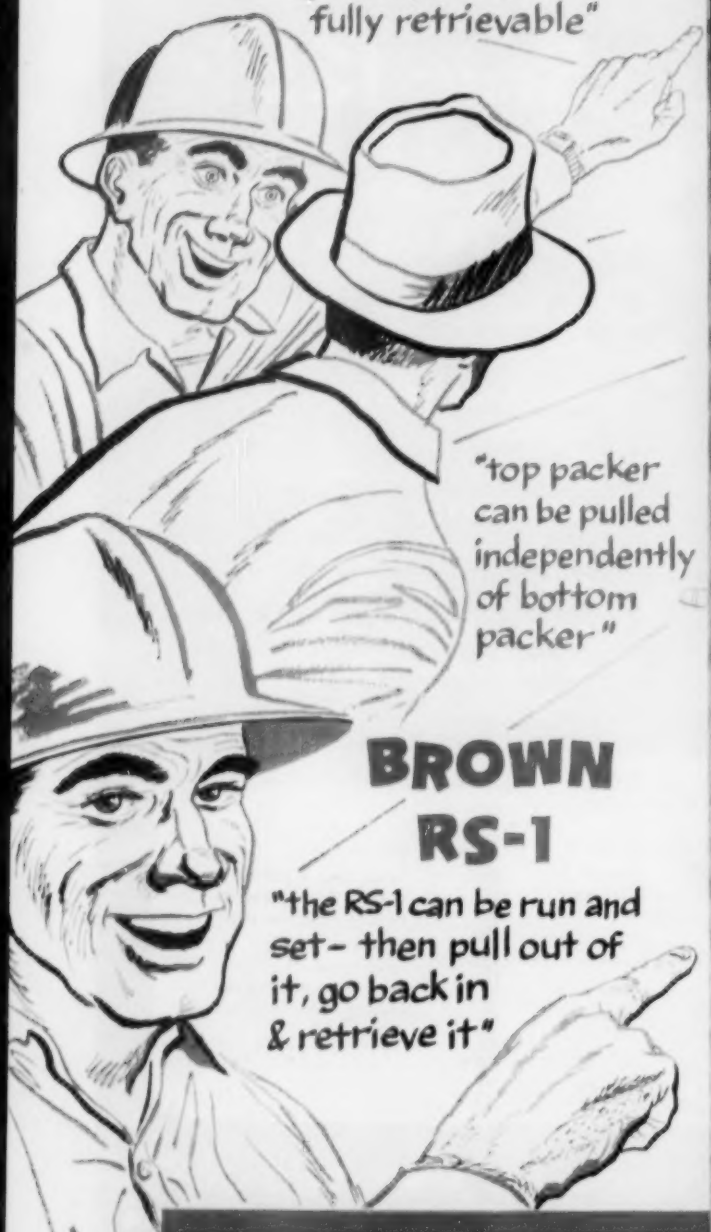
LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER Since 1880

THE BEST DUAL COMPLETION

BROWN DS-8

"both packers fully retrievable"



"top packer can be pulled independently of bottom packer"

BROWN RS-1

"the RS-1 can be run and set- then pull out of it, go back in & retrieve it"

BROWN OIL TOOLS, INC.
3214 CAMPBELL ST.
HOUSTON, TEXAS

DUAL STRING PACKER

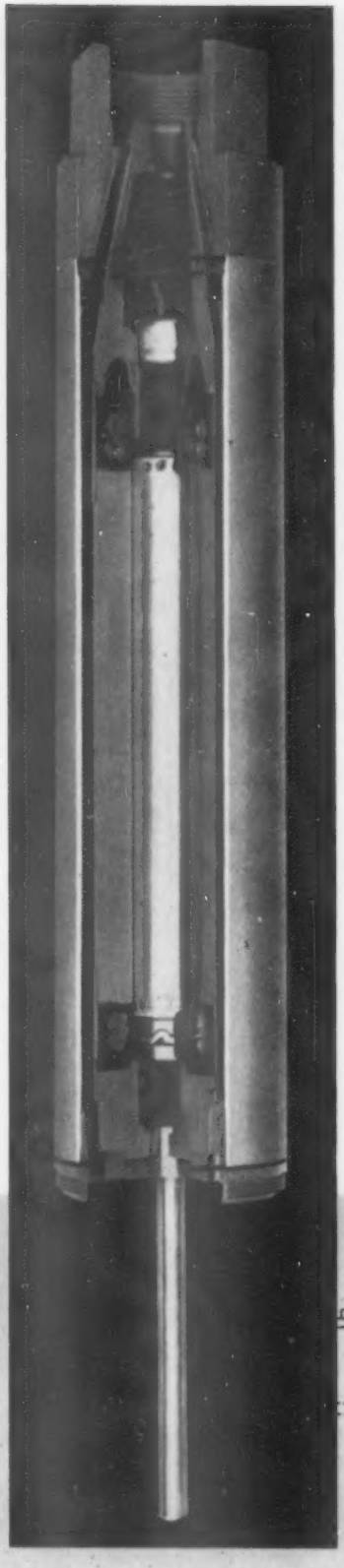
"runs both packers simultaneously"

"saves time- saves money!"

For further information, write: Brown Oil Tools, Inc.

BOT

IF YOU HAVE A PACKER PROBLEM — BROWN CAN HELP



7 "bonus values" of Leland's submersible motor!

Now both motor and pump can be installed right in your gasoline storage tank! Even with high octane gasolines, the new Leland explosion-proof motor eliminates vapor-lock . . . uses the gasoline itself for lubrication and cooling. This completely new ¾ hp, 230v AC thermally protected motor measures only 3½ inches in diameter . . . fits into existing tanks. It's fully U.L. Approved for Class I, Group D service.

Simple and rugged, built for long-life economy, this new Leland submersible pump motor has these 7 big advantages over other motors:

1. Completely self-contained unit includes outer shell necessary for gasoline passage – makes expensive extras unnecessary.
2. Extruded aluminum outer shell becomes main structural member – ribbed design provides much needed rigidity.
3. 9/16" chrome-steel shaft extension provides greater strength – prevents mechanical distortion.
4. Increased annular area allows 10% greater gasoline flow – minimizes trouble-making back pressure and turbulence.
5. Suction stub mounts without adaptor castings – reduces expense required with other motors.
6. Plastic-impregnated windings surpass wet-design insulation requirements – remain trouble-free for extra-long service life.
7. Leland's integrated motor design permits complete removal of pump or stub *without* disassembling motor.

In addition . . . a remote-control box is supplied with each Leland submersible pump motor. Includes thermal overload protector, line control and starting relays, starting and running capacitors.

30 years ago Leland developed the first gasoline curb pump motor to receive U.L. Approval – today, Leland gasoline pump motors outsell all others combined. So there's good reason why, for explosion-proof motors of any kind, your best bet is Leland. For more information, write, wire or phone us – TODAY!

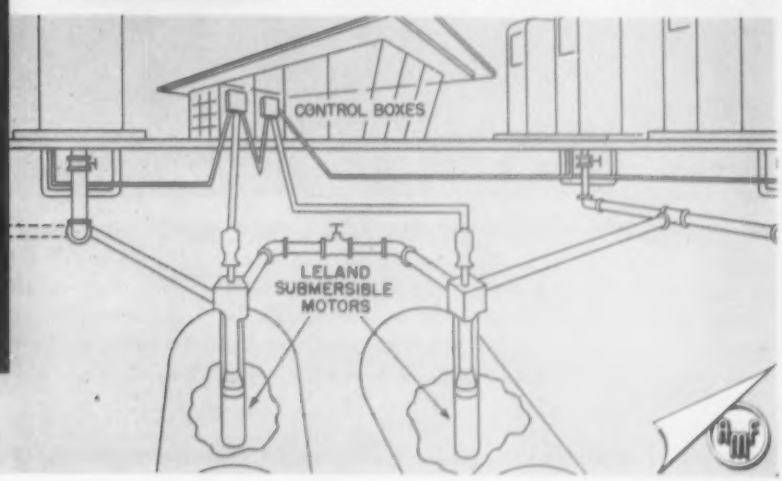
Another AMF Product

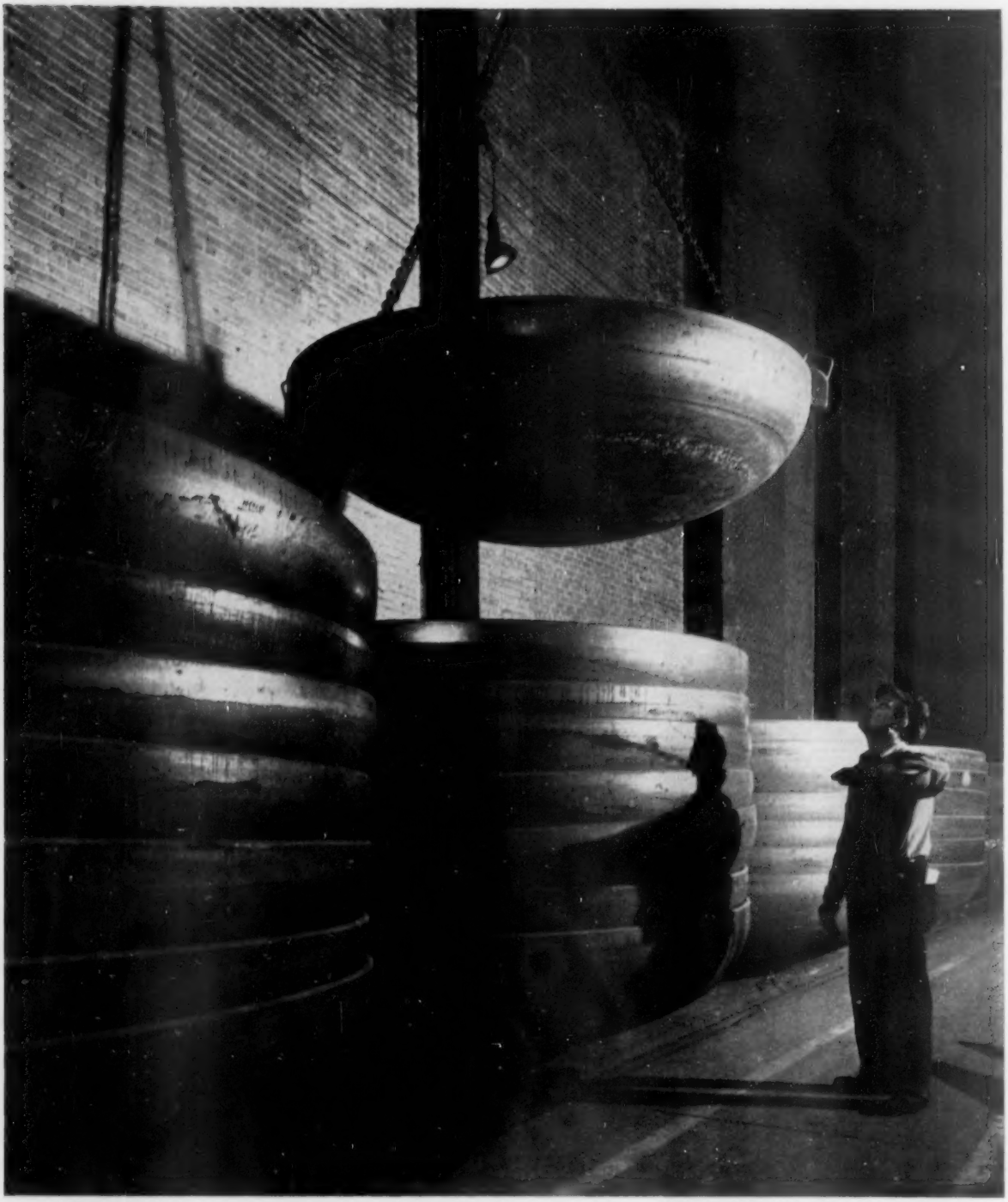
LELAND MOTORS

THE LELAND ELECTRIC COMPANY

Dayton 1, Ohio

Division of AMERICAN MACHINE & FOUNDRY COMPANY





FLANGED-AND-DISHED HEADS FOR EVERY NEED – Bethlehem flanged-and-dished heads come in a wide range of types and sizes to meet virtually every requirement. Types furnished include: ASME Code flanged-and-dished, standard, elliptical, flanged-only, dished-only, shallow-dished, tank-car, obround and double-dished. Diameters: up to 144 in.; thicknesses: 14 gage to 3½ in. Bethlehem also produces standard manhole and handhole saddles, covers and fittings, also collar flanges and pipe flanges, and can furnish heads with flued openings. Tell us about your requirements. The nearest Bethlehem sales office will be glad to furnish full details.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

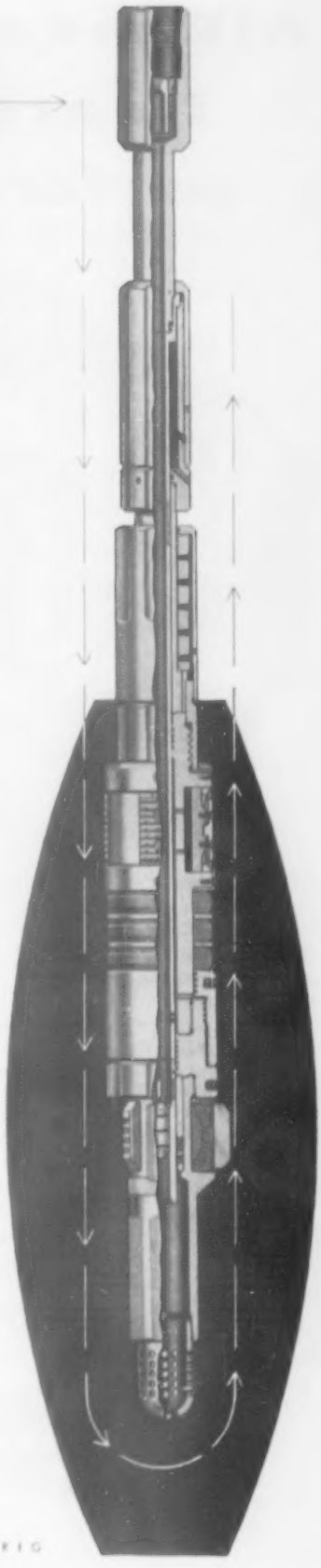
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

ROUND TRIP REMEDIAL TOOL

HALLIBURTON'S *hydraulic* RETRIEVABLE CEMENTER

CAN BE SET, RE-SET AND QUICKLY RETRIEVED!



Making every minute count on remedial jobs is the basic purpose of Halliburton's Hydraulic Retrievable Cementer (HRC). But—saving time is just one of the many advantages of this round-trip remedial tool that production-minded oil men are quick to profit by.

DOES MANY JOBS FASTER

Halliburton's HRC is versatile, too. It not only can be set and re-set repeatedly on one trip; it is designed to perform efficiently under the highest pressures and most difficult operating conditions encountered in squeezing cement, pumping acid, repairing casing leaks and many other jobs. After job is done and tool is retrieved, no drilling out time is required. All these advantages add up to substantial savings in production time that mean money in the bank . . . not down the hole.

EASY TO OPERATE

Since HRC is set by hydraulic pressure, operation requires very simple tubing manipulation. As setting pressure is applied, tubing is automatically pressure-tested. HRC requires no pressure on tubing to maintain set position. Simply picking up on the tubing releases the setting pressure from slips and packer rubbers and HRC is ready for the next job while still in the hole.

This time-saving retrievable tool gets many jobs done faster . . . saving expensive down time, and putting the well back on production sooner. Just ask one of Halliburton's trained, experienced field men. Call the nearest local or district office of the Halliburton Oil Well Cementing Company, Duncan, Oklahoma.

COMPLETE DATA SENT ON REQUEST

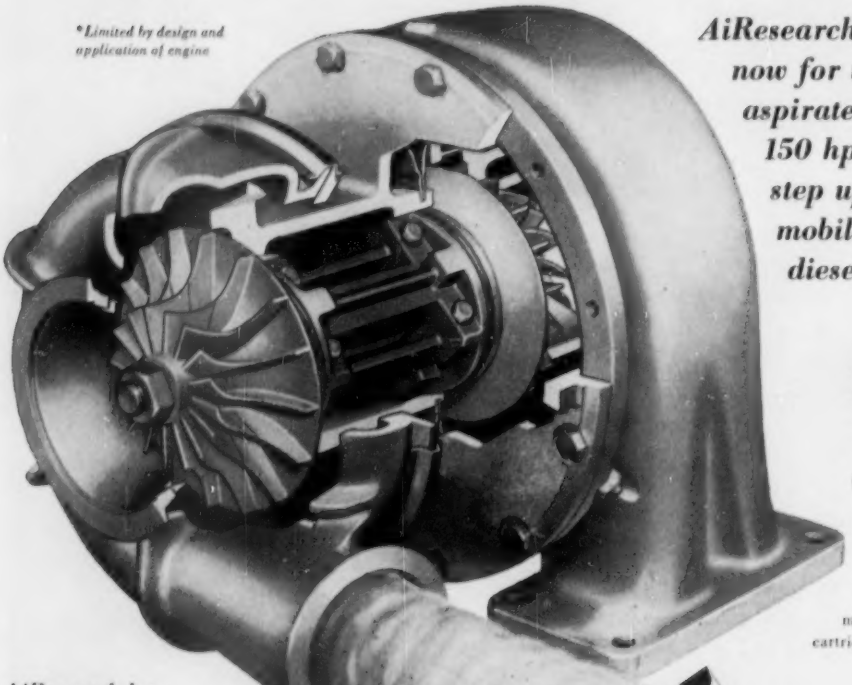
Add this valuable information to your Halliburton Service File

HALLIBURTON
CEMENTING SERVICES

251 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY RIG

AiResearch Turbochargers improve diesel engine performance up to 100%*

**Limited by design and application of engine*



AiResearch units are available now for use with normally aspirated diesel engines of 150 hp and up. They step up performance of both mobile and stationary diesels, land or marine.

Removable cartridge simplifies repair and overhaul

This cartridge contains the turbocharger's rotating assembly, bearings and seals in a factory balanced package. It can be replaced in minutes with another factory balanced cartridge by a mechanic on the scene.

AiResearch has more experience in the design and manufacture of small turbomachinery than any other company. AiResearch turbochargers are the most efficient and safest units of their kind. New additions to the AiResearch family of turbochargers have widened their range of application in the diesel engine industry.

Our engineers welcome the opportunity to work with you in improving the performance of your diesel engines. We are happy to confer on applications of the turbocharger principle to your power plants.

AIRESEARCH TURBOCHARGERS NOW AVAILABLE

MODEL	T-10	T-15	T-16	T-30
Diameter — in. nom.	9	13¾	11½	15¼
Length — in.	9	16¾	15¾	17¼
Weight — lb.	39	125	100	135
Output — lb/min. (Standard Conditions)	25-40	35-65	45-65	70-95

THE GARRETT CORPORATION

AiResearch Industrial Division

9225 South Aviation Blvd., Los Angeles 45, California

DESIGNERS AND MANUFACTURERS OF TURBOCHARGERS AND RELATED MACHINERY

He skipped the same 2 valves again today

Both are still in adjustment. Still no leaks, not even at the shank! Both are OIC plug valves. If he's curious enough to dismantle one, he'll see the OIC gland and O-ring construction that saves him time and cussing. It's different from other plug valves he's seen.

Three efficient seals prevent shank leakage on OIC plug valves. Concentric grooves machined into the gland liner form a "labyrinth" seal. The liner also retains an O-ring in contact with the plug's top face for a second positive seal. And resilient packing between gland and gland liner forms the third seal.

But the maintenance man measures design by *results*. OIC plug valves get his O. K. because they stay in adjustment a long time without leakage. However, if *you* are interested in the exclusive gland design and construction of these OIC plug valves, write for specification literature.

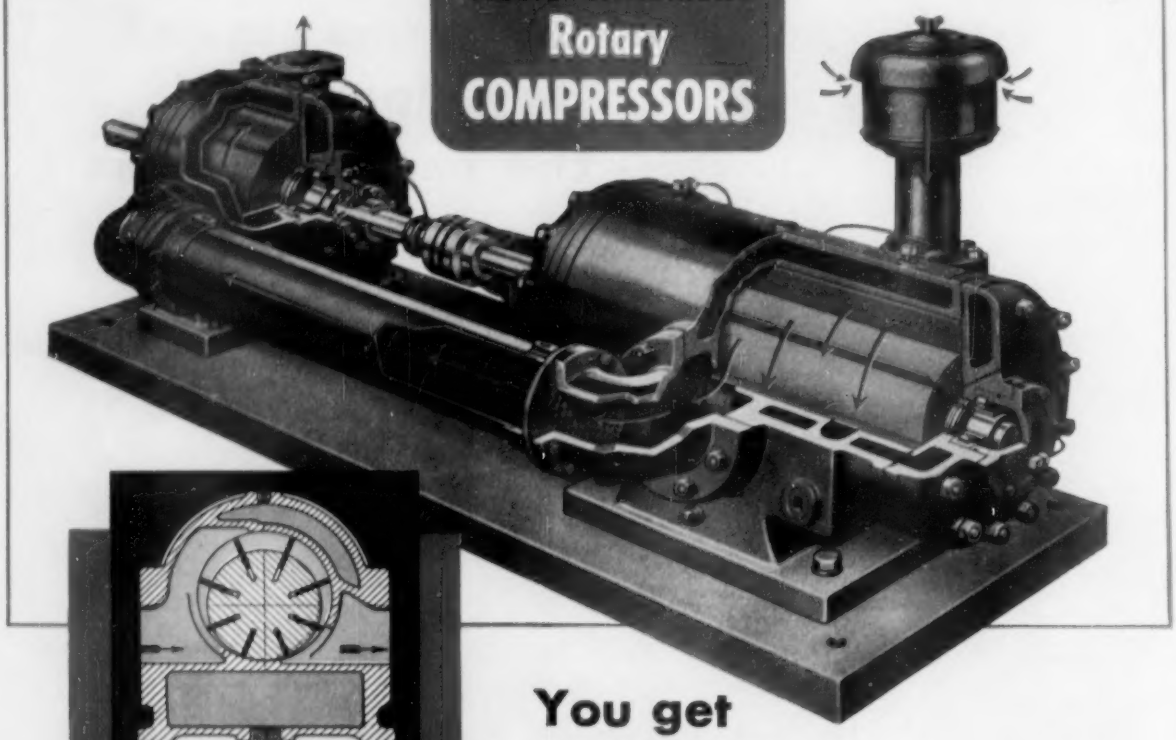
The Ohio Injector Company • Wadsworth, Ohio

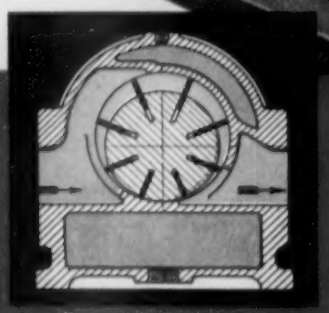
OIC VALVES

FORGED & CAST STEEL, LUBRICATED
PLUG, BRONZE & IRON VALVES

ALLIS-CHALMERS

Rotary COMPRESSORS





HOW *RO-FLO* UNITS OPERATE

Centrifugal force moves blades to outside wall to form air chamber.

You get MORE ADVANTAGES

with *RO-FLO* units for shop air, drilling, gas handling

TYPE and SIZE for EVERY NEED

Both single and two-stage *Ro-Flo* compressors are available. Single-stage units for pressures to 50 pounds gauge, and volumes from 42 to 3245 cfm.

Two-stage units in twelve sizes for 250 to 1800 cfm at pressures from 60 to 125 pounds gauge.

Single and two-stage *Ro-Flo* vacuum pumps for vacuums to 0.3 inch mercury absolute, from 22 to 5950 cfm.

Call your nearest A-C office or write for bulletins 16B8244 (two stage) and 16B8126 (single stage). Allis-Chalmers, Industrial Equipment Division, Milwaukee 1, Wisconsin.

1. **CONSTANT EFFICIENCY** — During operation the sliding vanes of the rotor press against the cylinder wall to form air cells. Even if these vanes wear, the rotating force holds them in contact with the cylinder wall so that efficiency and air flow never change.
2. **LOW-COST FOUNDATIONS** — Smooth rotation cuts vibration. This eliminates need for heavy foundations used with reciprocating-type units. Small units can be bolted directly to the floor. Large units need only a simple slab.
3. **COMPACTNESS** — No extra weight or extra size is needed to dampen vibration. Every inch is devoted to air or gas handling.
4. **LOW MAINTENANCE** — There is no wear and tear from shock and vibration . . . no pistons and valves.

Ro-Flo is an Allis-Chalmers trademark.

A-5028

ALLIS-CHALMERS

JOHNSTON

Unit Line

SUMP PUMPS

Steep Head Capacity Insures 2½ to 3½ times Better Performance

Due to steep head-capacity and non-overloading power characteristics, Johnston Unit-Line Vertical Sump Pumps offer you greater efficiency over a wider range. Due to improved scientific design, this is the only sump pump that can pump up to 350 feet of head—2½ to 3½ times that of ordinary sump pumps. No packing gland maintenance, no bearings to lubricate below base level, no priming necessary.

FOR MOVING WATER, CONDENSATE, GASOLINE, OILS, CHEMICALS AND OTHER LIQUIDS

Here is a typical installation in a main-line crude oil station.

JOHNSTON PUMP COMPANY

Founded in 1909

BIN "K", PASADENA 15, CALIFORNIA

Get the full story. Mail coupon today.

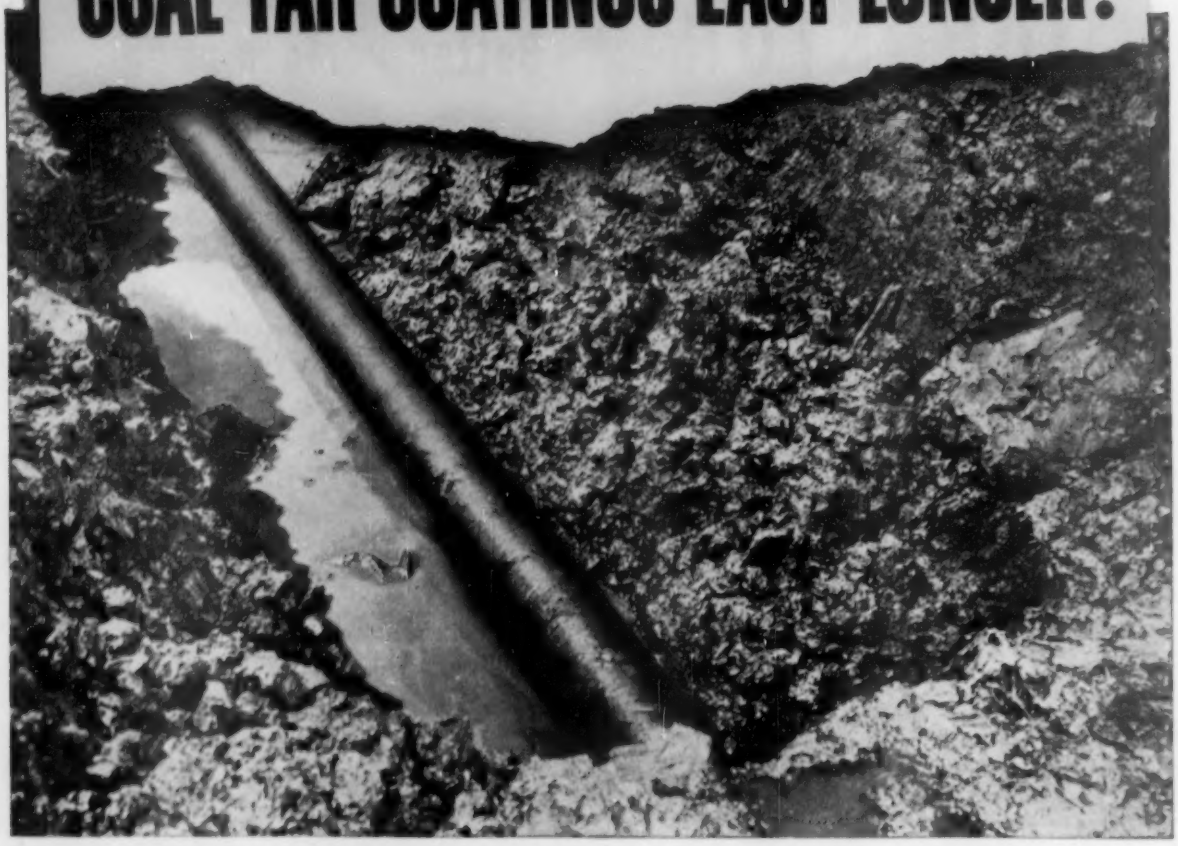
☐ Send bulletins ☐ Have representative call

Name_____

Address_____

City_____ Zone____ State_____

HERE'S 23 YEARS OF PROOF THAT COAL TAR COATINGS LAST LONGER!



THIS coal tar-protected pipeline was buried 23 years in soil permeated with salt water and industrial refuse. But when it was unearthed for inspection, the coating showed no signs of deterioration or failure of any kind!

Isn't that the kind of *proven* protection *you* want? It's the kind of protection you *get* when you specify *Pitt Chem* Coal Tar Pipeline Coatings. For these coatings have demonstrated their tremendous ability to resist soil stress and water absorption—the two principal reasons why "economy" coatings eventually fail.

When you buy *Pitt Chem*, you buy assured pipeline protection with every drum, because *Pitt Chem* Coal Tar Coatings are manufactured to published specifications. ● Call on a *Pitt Chem* man to help you plan your next pipeline protection job. He's fully equipped to give you valuable technical assistance . . . and to guide you to long-run protection economies.

PITT CHEM® TAR BASE COATINGS

- Standard Grade • Modified Grade
- Plasticized Grade • Hotline
- Cold Applied Tar Base Coatings

PROTECTIVE COATINGS DIVISION

PITTSBURGH COKE & CHEMICAL CO.

Grant Building • Pittsburgh 19, Pa.

WSW 5955

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

GRANT
OIL TOOL COMPANY

Effective Drill String Stabilization with this GRANT CUSHION STABILIZER drills FASTER hole CHEAPER

No. 4 of a series on how Grant specialties in one job: Building the tools that help you drill wells better!

Cushion Stabilizer

YOU KNOW that one of the best ways to reduce cost per foot of hole is to boost rate of penetration. And one of the best ways to boost rate of penetration is to stabilize your string against shock loads and lateral movement of the drill collars or pipe.

The tool for this job is the new Grant Cushion Stabilizer, and here's why:

MORE WEIGHT ON BIT

The Grant Cushion Stabilizer permits up to 80% more weight on the bit without increasing hole deviation. There's where you can top *any* previous unstabilized penetration rates in similar formation!

STRAIGHTER HOLE

Because the Grant keeps collars centered yet rotating freely, similar to a bearing around a shaft, you can drill straighter hole with more weight. At the same time, you protect your string and add to its useful life.

Placed at the proper points in your drill collar string, the Grant Cushion Stabilizer absorbs lateral movement while allowing collars to rotate freely on tough, fluid lubricated rubber. Since the rubber boots do not turn in the hole, there is no tendency for them to ball up or restrict full circulation. If washover operations are required, the boots lock to the body of the tool—an important safety point.

YOU CAN USE THE GRANT CUSHION STABILIZER

- **for maximum stabilization of the drill collar string**
- **to keep collars from rubbing the wall in high angle hole**
- **as crossover subs between drill collars and drill pipe**
- **for gaining or losing angle, as desired**
- **preventing metal-to-metal contact while drilling out of top hole casing.**

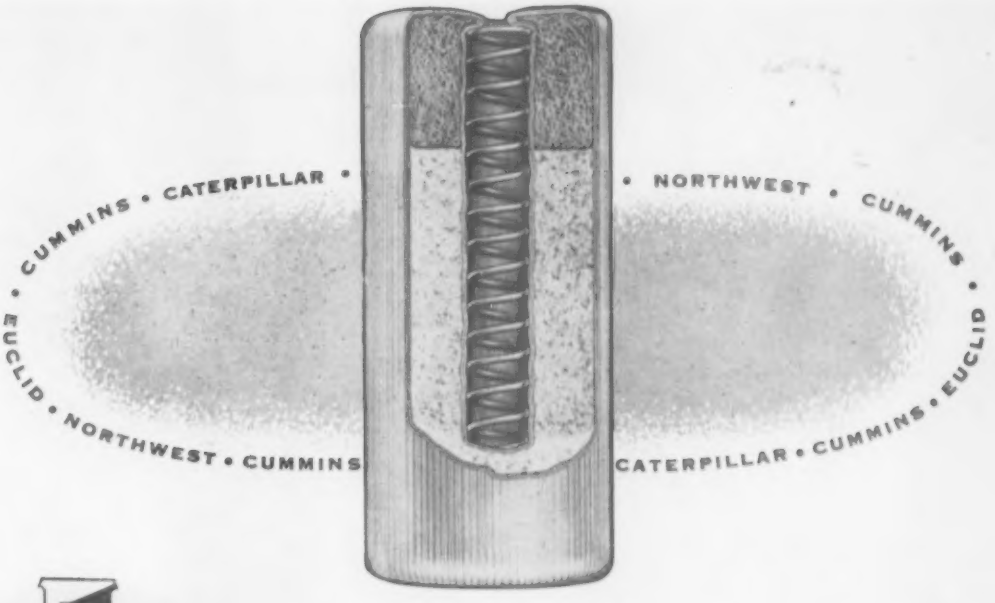
Model 1530 Regular Reamer | Underreamer | Model 1540 Wall Scraper | Driblade Stabilizer | Model 6480-A Reamer Near Bit Type

For details, talk with your nearby Grant field man, or write direct for Bulletin 63. Learn how you can cut cost-per-foot with drill string stabilization—by Grant!

GRANT
OIL TOOL COMPANY

Main office and Plant: 2042 East Vernon Avenue, Los Angeles 58, California

Avenal—Phone 228
Bakersfield—Phone FAirview 5-0507
Compton—Phone Newmark 5-6041
TEXAS—Odessa—Phone 6-4502
Houston—Phone Mission 4-0631
OKLAHOMA—Oklahoma City—Phone Melrose 7-3251
LOUISIANA—Lafayette—Phone 6-2145
Harvey—Fillmore 1-2892
NEW MEXICO—Hobbs—Phone 3-4211
CANADA—Edmonton—Phone 35-2213
EXPORT—New York City—Phone Rector 2-2455



MANNIX LTD.

PROTECTS ITS ENGINES WITH WINSLOW FILTERS

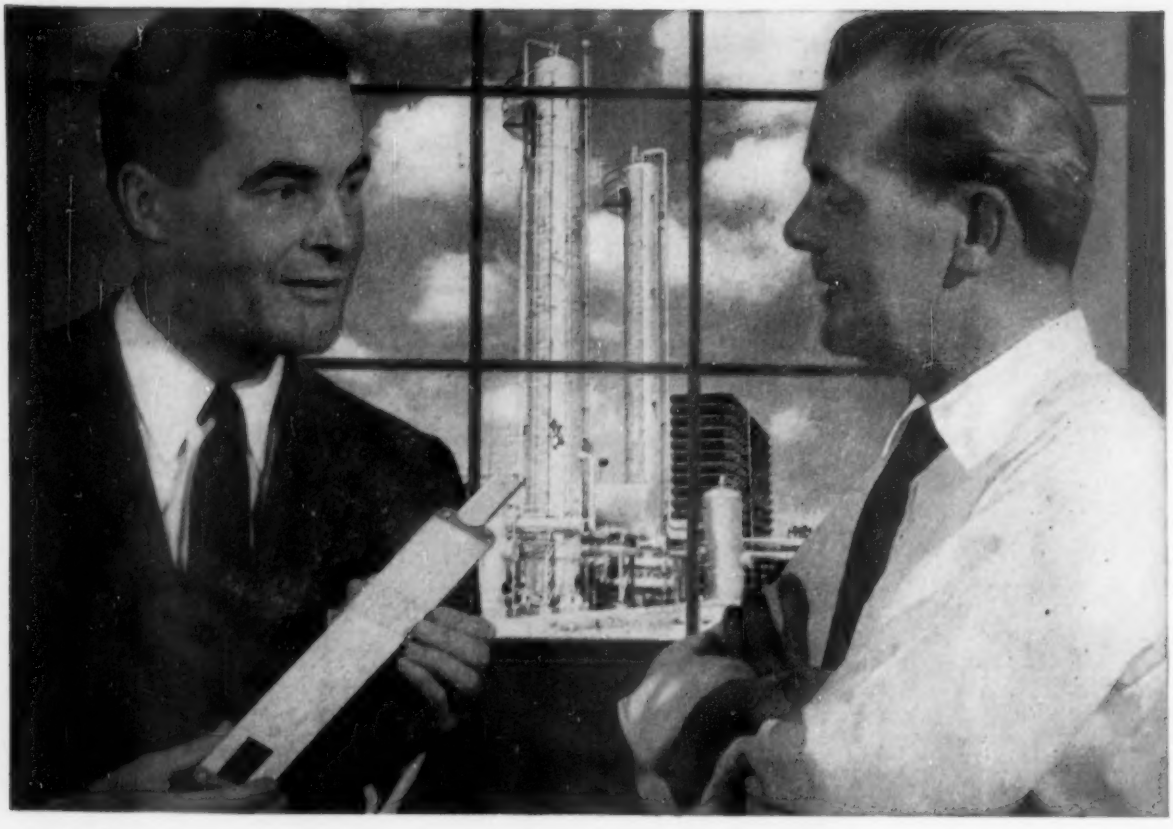
Mannix Ltd., operators of one of the largest machinery pools in North America, last year standardized on Winslow CP* elements for practically all powered equipment. Engine filters are stenciled to identify the correct filter element, and maintenance men and operators are provided with cross reference manuals that also specify the elements to be used.

According to Mannix service records, Winslow Filters have improved both the useful life of oil and the life of equipment, and the standardization program has shown advantages in efficiency and economy. The principal gain has been in longer periods between engine overhauls, and reduced repair costs and operating expense for many types of powered equipment.

WINSLOW FILTERS

CP (controlled pressure) is protected by patents and trademarks.*

Winslow Engineering and Manufacturing Co. • 4069 Hollis Street • Oakland 8, California



You get more than gas treating chemicals from CARBIDE...

CARBIDE's mono- or diethanolamine give you excellent removal of CO_2 and H_2S. By converting the extracted H_2S to sulfur or H_2SO_4, you benefit by recovering a valuable product—thus reducing your operating costs.

CARBIDE's di- or triethylene glycol remove H_2O economically from gas streams. The low initial investment and low operating costs of glycol type plants provide minimum dehydration charges.

Plus Benefits

- Technical data gathered from 22 years experience producing and supplying gas treating chemicals. These data can help you in construction of new facilities, the enlargement of present equipment and in securing trouble free performance of existing plants.
- Technical help from field representatives and service laboratories.
- Fast delivery from warehouses located near major gas fields.
- Constant source of supply.

Find out for yourself how CARBIDE can help you. Write today to Carbide and Carbon Chemicals Company, Room 308, Department H, 30 East 42nd Street, New York 17, New York.

In Canada: Carbide Chemicals Company, Division of Union Carbide Canada Limited, Montreal. In Western Canada: Harrisons and Crossfield.

CARBIDE AND CARBON CHEMICALS

Carbide and Carbon Chemicals Company
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.

Simplicity and Compactness

BAASH-ROSS "UPS" CASING AND LANDING HEADS

Ideal for Medium and Low Pressure Wells

- Slips and Packing unitized and hinged.
- Easy installation without first cutting casing or stripping.
- Uniform slip support by unitized design.
- Packed off by gland bolts for effective seal.
- No wasted space means minimum overall height.

Available in complete range of sizes. Also in Demountable Flange design for added economies on multiple well installations.

BAASH-ROSS TOOL COMPANY

DIVISION OF JOY MANUFACTURING COMPANY

Los Angeles, Calif. • Houston, Texas • Odessa, Texas • Oklahoma City, Okla. • Casper, Wyo. • Olney, Ill. • Edmonton, Alb., Canada • New York City

SAVE 2 WAYS WITH

MARTIN RUBBER GUIDE CAGES

1. GREATER PRODUCING PROFITS *because:*

Martin Cages last much longer. The oil-proof rubber guides do the trick, by absorbing the ball peen hammer action of the hard balls. They also have superior resistance to sand abrasion. And they can be replaced.

2. GREATER PRODUCING PROFITS *because:*

Ball & Seat life is usually doubled, on the average. With the rubber guides, there is much less chattering, chipping and pitting. Ball falls true on seat. Such improvement in Ball & Seat life eliminates a lot of pulling expense.

In the last year alone, new users of Martin Cages have increased by 85%. The word is getting around. More and more economy-minded producers are learning about the advantages of the Martin Cages! . . . Manufactured in open and closed types . . . all diameters and styles. Write for John Martin Catalog No. 4 today. *Martin Cages are available through all supply stores.*

JOHN N. MARTIN

Manufacturer

9 W. BRADY • TULSA, OKLA.

Transportation. Rough country and bad weather are no obstacles to 'Jeep' vehicles. With the extra traction of their 4-wheel drive, they carry men, tools and equipment anywhere on the lease—shift easily into conventional 2-wheel drive for highway travel.

How 4-wheel drive 'Jeep' vehicles do your tough jobs...better!

Prospecting. The 'Jeep' Truck, with its go-anywhere 4-wheel drive, is ideal for drilling shot holes in remote places. With power take-off, it operates a mobile drill for borings as deep as 300 feet.

Mobile Power. With power take-off, the Universal 'Jeep' supplies power for welders and many other types of equipment. The 'Jeep'-welder unit follows the pipeline wherever it goes.

Out on the lease...along the pipeline...to the places the roads don't reach...'Jeep' vehicles carry men, tools and equipment. With the extra traction of their 4-wheel drive, they go cross-country through mud, sand and soft earth, and carry full loads up and down rough grades as steep as 60%.

More and more, the oil industry is using 'Jeep' vehicles with power take-off as a mobile power source for welders, compressors, generators, winches and a variety of other equipment.

Because 'Jeep' vehicles do an almost endless number of jobs... because of their long life and low-cost maintenance...they provide many opportunities for savings. See your Willys dealer for a convincing demonstration, or write for information.

The 'Jeep'®

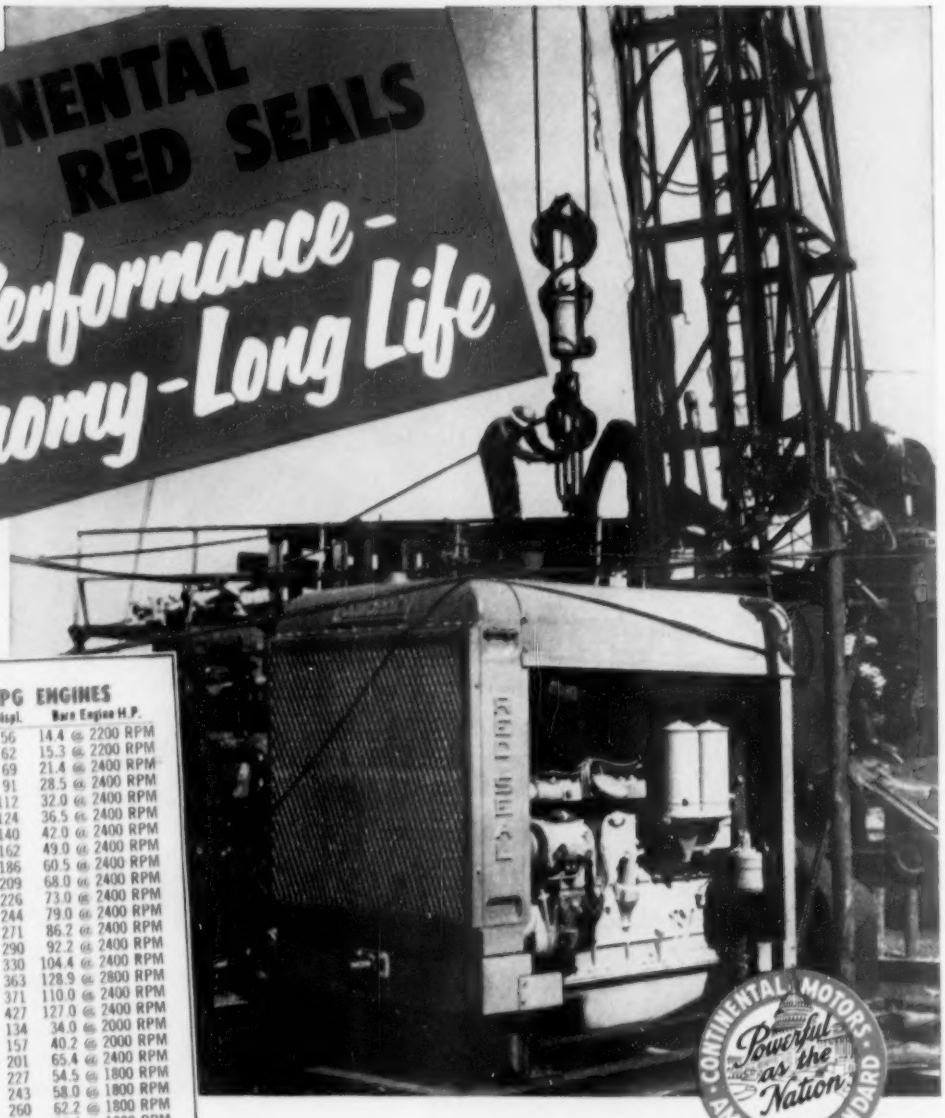
family of 4-wheel drive vehicles

WILLYS...makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

CONTINENTAL RED SEALS

for Performance - Economy - Long Life



GASOLINE AND LPG ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Rate Engine H.P.
N56	4	2¼	3½	56	14.4 @ 2200 RPM
N62	4	2⅛	3½	62	15.3 @ 2200 RPM
Y69	4	2½	3½	69	21.4 @ 2400 RPM
Y91	4	2⅞	3½	91	28.5 @ 2400 RPM
Y112	4	3 5/16	3½	112	32.0 @ 2400 RPM
F124	4	3	4⅛	124	36.5 @ 2400 RPM
F140	4	3 5/16	4⅛	140	42.0 @ 2400 RPM
F162	4	3 5/16	4⅛	162	49.0 @ 2400 RPM
F186	6	3	4⅛	186	60.5 @ 2400 RPM
F209	6	3 5/16	4⅛	209	68.0 @ 2400 RPM
F226	6	3 5/16	4⅛	226	73.0 @ 2400 RPM
F244	6	3 5/16	4⅛	244	79.0 @ 2400 RPM
M271	6	3⅜	4⅛	271	86.2 @ 2400 RPM
M290	6	3¼	4⅛	290	92.2 @ 2400 RPM
M330	6	4	4⅛	330	104.4 @ 2400 RPM
M363	6	4	4 11/16	363	128.9 @ 2800 RPM
B371	6	4⅛	4⅝	371	110.0 @ 2400 RPM
B427	6	4 5/16	4⅛	427	127.0 @ 2400 RPM
G134	4	3⅛	4⅛	134	34.0 @ 2000 RPM
G157	4	3⅛	4⅛	157	40.2 @ 2000 RPM
E201	4	3⅜	4⅛	201	65.4 @ 2400 RPM
H227	4	3⅜	5½	227	54.5 @ 1800 RPM
H243	4	3¼	5½	243	58.0 @ 1800 RPM
H260	4	3⅛	5½	260	62.2 @ 1800 RPM
H277	4	4	5½	277	66.4 @ 1800 RPM
K363	6	4	4 11/16	363	123.0 @ 2400 RPM
J382	4	4½	6	382	74.0 @ 1400 RPM
T371	6	4½	4⅝	371	119.0 @ 2400 RPM
T427	6	4 5/16	4⅛	427	140.0 @ 2400 RPM
U501	6	4½	5¼	501	159.0 @ 2400 RPM
R513	6	4½	5⅛	513	164.3 @ 2400 RPM
R572	6	4¾	5⅛	572	182.4 @ 2400 RPM
R602	6	4⅛	5⅛	602	191.7 @ 2400 RPM
V603	8	4¼	4¼	603	220.0 @ 2800 RPM
S749	6	5⅛	5½	749	217.0 @ 2200 RPM
S820	6	5⅝	5½	820	237.0 @ 2200 RPM

CUSHIONED POWER DIESEL ENGINES

Model	Cyl.	Bore	Stroke	Displ.	Rate Engine H.P.
ZD129	4	3¼	3⅛	129	34.0 @ 2000 RPM
GD157	4	3⅛	4½	157	39.0 @ 2000 RPM
*ED201	4	3⅝	4½	201	45.8 @ 2000 RPM
HD243	4	3¼	5½	243	55.0 @ 2000 RPM
*HD260	4	3⅛	5½	260	59.0 @ 2000 RPM
*HD277	4	4	5½	277	63.0 @ 2000 RPM
*JD382	4	4½	6	382	72.5 @ 1600 RPM
TD427	6	4 5/16	4⅛	427	106.0 @ 2000 RPM
RD572	6	4¾	5⅛	572	154.0 @ 2000 RPM
VD603	8	4¼	4¼	603	175.0 @ 2600 RPM
SD802	6	5 5/16	5½	802	202.0 @ 1800 RPM

*Available for industrial applications only.

CONTINENTAL MOTORS · Powerful as the Nation · AMERICA'S STANDARD ®

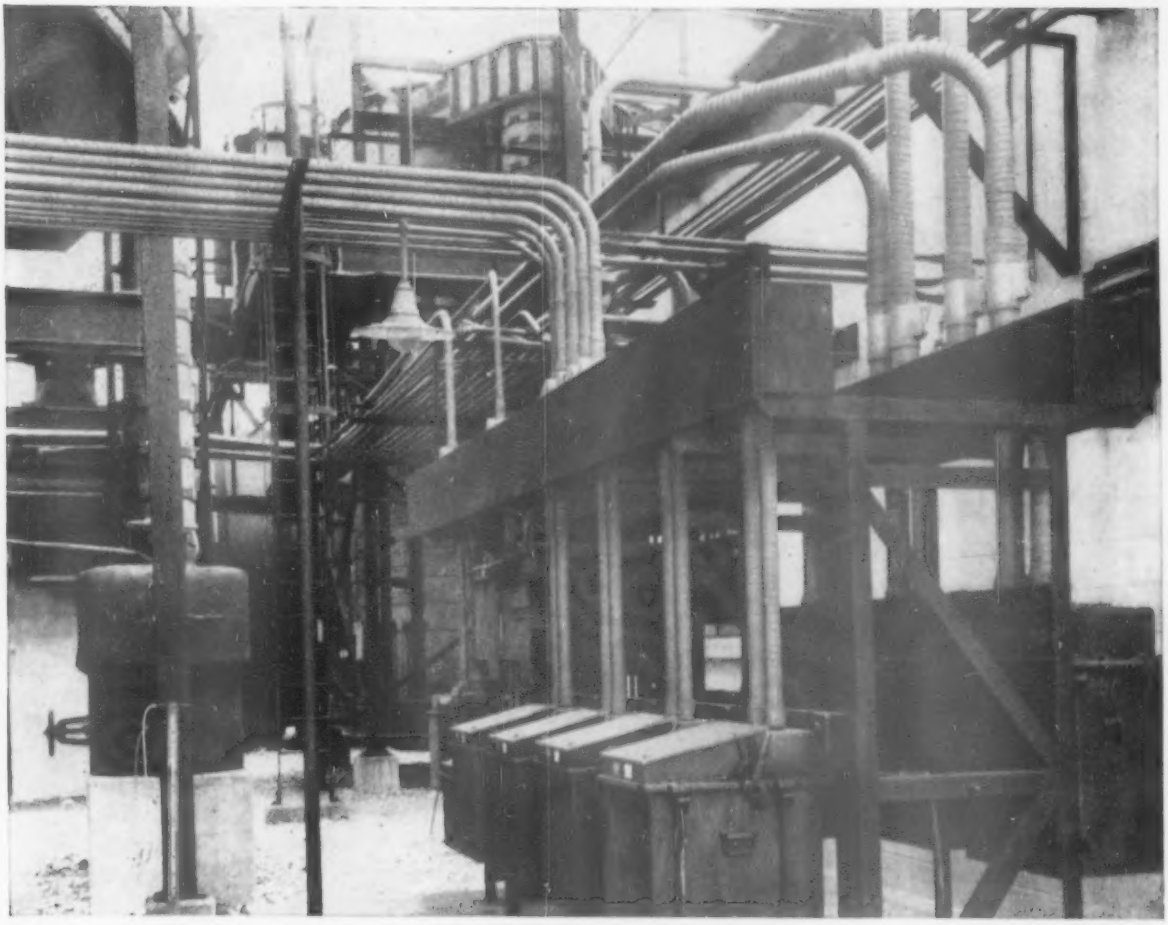
One reason for the oil field's widening acceptance of Red Seal power is the diversification of the Red Seal line. Long-range satisfaction with any piece of equipment depends largely on the closeness with which the engine is matched to its work. And with 47 different basic models from which to choose—each capable of still closer tailoring to the job's specific needs, through specification changes—your requirements can be met exactly, no matter what the application.

SERVICE AND GENUINE RED SEAL PARTS SOLD EVERYWHERE

Continental Motors Corporation

MUSKEGON • MICHIGAN

6 EAST 45TH STREET, NEW YORK 17, NEW YORK • 6218 CEDAR SPRINGS ROAD, DALLAS 9, TEXAS • 3817 SOUTH SANTA FE AVENUE, LOS ANGELES 58, CALIFORNIA • 1252 OAKLEIGH DRIVE, EAST POINT (ATLANTA) GEORGIA



Polyken® protective coating beats corrosion in this sulphuric acid plant

They're using durable Polyken Tape *to protect electrical conduit in and around the cooling tower*

The Switch Box and Controller Station you see here is located at the cooling tower of Gulf Oil's Port Arthur, Texas, sulphuric acid plant. As you know, where there's sulphuric acid, there's a big need for protection against corrosion.

Formerly, they used paint on the electrical conduit. That lasted only three or four months.

But *Polyken* Protective Coating has kept the conduit in excellent condition since 1953. The tape itself is in excellent condition, too.

Polyken Tape gives dependable protection because it's manufactured from controlled raw materials under controlled conditions. Its tough polyethylene backing offers high electrical insulation resistance, high resistance to corrosive action.

Just as important, *Polyken* Protective Tape Coatings go on right from the roll. The thick adhesive mass provides strong adhesion to cylindrical surfaces and a self-seal at the lap. That means faster, more effective, lower-cost application—when it's put on and in the long run. Send the coupon or see catalog in Sweets Industrial File, Sec. 6c/Ke.

Polyken®

CONTROLLED STRENGTH

PROTECTIVE COATINGS

THE KENDALL CO., POLYKEN SALES DIVISION

Polyken, Dept. OG-H
309 W. Jackson Blvd., Chicago 6, Illinois

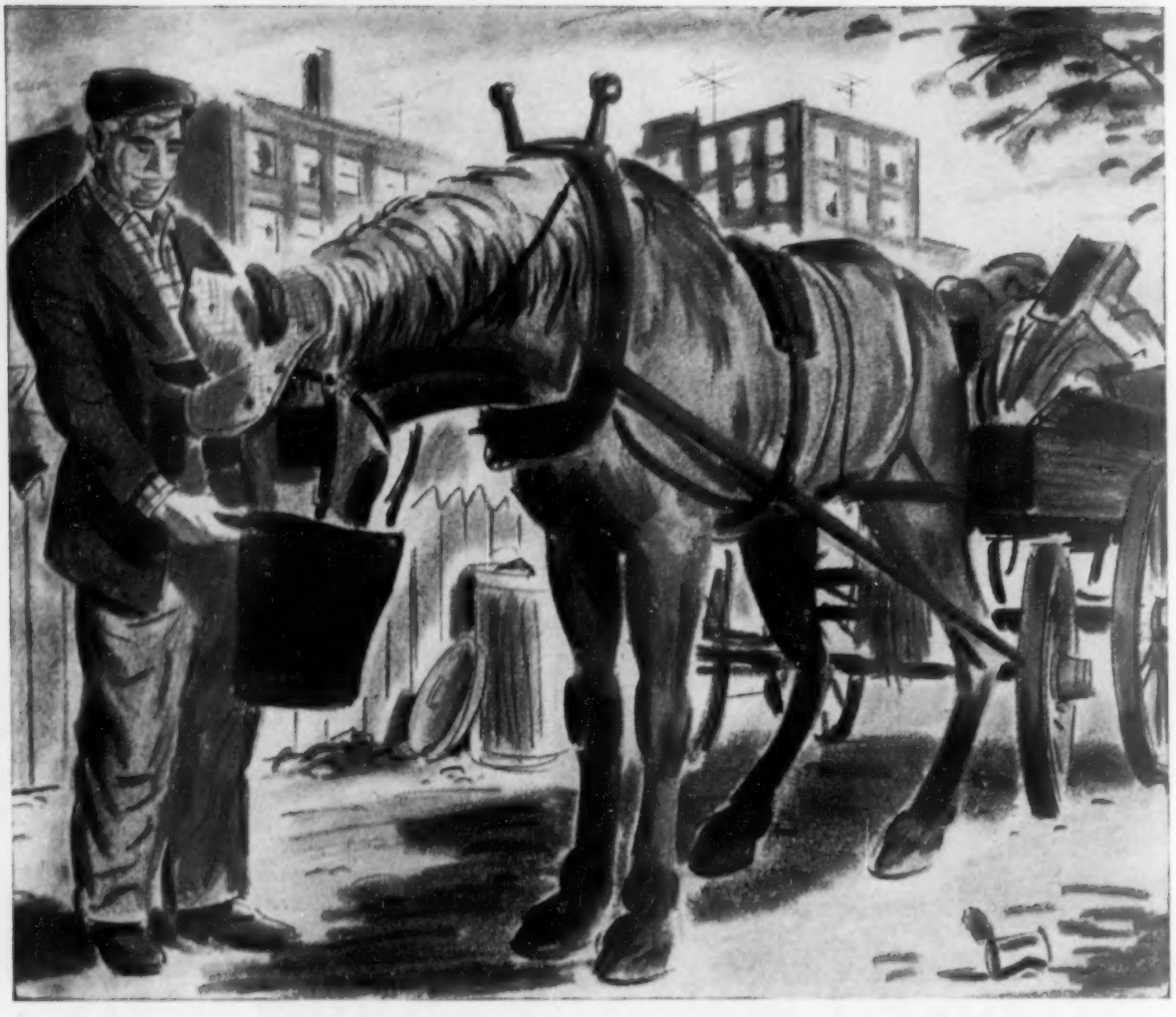
Please send me samples and further information on *POLYKEN* PROTECTIVE TAPE COATINGS.

Name _____ Title _____

Company _____

Street Address _____

City _____ Zone _____ State _____

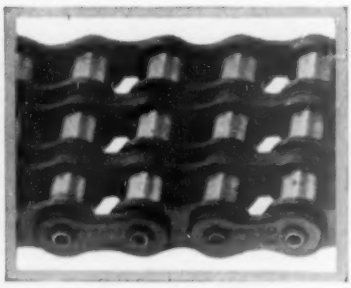


You need longest possible service life in roller chains, too...

You know what down time cost you ...and you know the extra profits you make by the elimination of unnecessary down time! Well, suppose you could get a roller chain that would last longer and eliminate premature failures. And, suppose when you want to take the chain down, it could be taken down and replaced in far less time. Wouldn't that add up to a substantial saving?

That's why you owe it to yourself to investigate Rex Oil Field Roller Chains for your rigs. Because these chains *have* all those time-saving, profit-making features. Revolutionary pitch control system, tremendously strengthened pin holes, top-quality materials, "glide-fit" design that makes assembly and disassembly easy, are among the many reasons why Rex Roller Chains give you the far longer service life you want... help you drill more feet of hole per day and per year. There's no better chain made!

Get the complete story from your supply store, your Rex® Field Sales Engineer, or write directly to CHAIN Belt Company, 4619 W. Greenfield Ave., Milwaukee 1, Wis., for your copy of Catalog No. 55-3.



CHAIN BELT COMPANY

MILWAUKEE 1, WISCONSIN

OIL FIELD OFFICES: DALLAS • HOUSTON • TULSA • MIDLAND • LOS ANGELES • NEW YORK

wherever

oil men

gather...

you hear

it more

and more...

"for my money... it's

The Fort Worth

National Bank"

MEMBER FEDERAL DEPOSIT INSURANCE CORPORATION

balanced...

WITH HIGH PORE VOLUME

Aerocat® fluid cracking catalyst

For highest cracking efficiency—we have carefully balanced the new high pore volume with pore diameter, particle shape, particle size distribution and hardness.

The result is the first truly balanced catalyst offered for optimum performance in fluid catalytic cracking units.

Cyanamid was first to deliver a *high pore volume* catalyst.

For further information, ask your Cyanamid representative about AEROCAT Fluid Cracking Catalyst with high **PV.**

CYANAMID

AMERICAN CYANAMID COMPANY

REFINERY CHEMICALS DEPARTMENT

30 Rockefeller Plaza • New York 20, N. Y.

In Canada: North American Cyanamid Limited, Toronto and Montreal

THE MAGIC WORD

FOR BETTER OIL FIELD SUPPLIES AND SERVICE

Miraculous is really the word for the service that the Misco Kid can give when the chips are down. All you have to do is call for Misco at any of these strategic locations in a six-state area, and you, too, can get the tops in oil field supplies from personnel who understand your problems.

WHERE YOUR BUSINESS IS ALWAYS GOOD BUSINESS

KANSAS
Anthony
Augusta
Great Bend
Independence
McPherson
Madison
Plainville
Russell

MOUNTAIN IRON AND SUPPLY COMPANY

PHONE AM 7-4238
Rule Building
321 East William, Wichita, Kansas

COLORADO
Denver
NEBRASKA
Kimball
OKLAHOMA
Bartlesville
Pawhuska
Tulsa
TEXAS
Dallas
WEST VIRGINIA
Parkersburg

more SOLA-FLEX® expansion joints working for General Petroleum

OVERHEAD STEAM lines move with changes in temperature and pressure. At the Torrance (California) Mobilgas Refinery of General Petroleum Corporation, a pair of Sola-Flex hinged joints absorb more than 18 inches of lateral movement in piping from the boiler plant to the TCR unit. Rugged Sola-Flex bellows, available in all standard pipe sizes, can help you solve difficult pressure and temperature problems. Write for a Sola-Flex catalog today. Address Dept. C-57, Solar Aircraft Company, San Diego 12, California.

SOLAR
AIRCRAFT COMPANY
SAN DIEGO DES MOINES

Designers, Developers and Manufacturers • Gas Turbines • Aircraft and Missile Components • Bellows • Controls • Castings • Metal Alloy Products

Clear proof you can prevent plugging caused by iron in injection water!
CITRIC ACID ADDED
In this glass, only 10 ppm of Pfizer Citric Acid has been added to brine containing 2 ppm iron
NO CITRIC ACID
The brine in this glass also contains 2 ppm iron. But no citric has been added

● The cloudiness of the brine at right is caused by insoluble iron salts. Continuous injection of this water in secondary recovery causes plugging at the interface.

As you can see from the picture on the left above, Pfizer Citric Acid keeps the iron in your injection water from precipitating out . . . and thus piling up deposits at the interface.

Net result: Regular use of Pfizer Citric Acid will keep your injection rates high easily and economically. Also cuts down the frequency of expensive acidizing.

Pound for pound, citric acid sequesters iron better and at less cost than any other agent. High calcium and magnesium waters will not interfere with citric's iron-sequestering ability.

Nontoxic, safe to handle—Pfizer Citric Acid is excellent preventive medicine—whether for secondary recovery or pressure maintenance work. Pfizer supplies huge amounts of citric acid for a multitude of industrial uses throughout the world. This broad distribution pattern assures you of receiving all the citric you need without delay. (Just recently, Pfizer has opened a new warehouse in Dallas to serve the Southwest.)

For further information on preventing injection well plugging with Pfizer Citric Acid write to:

Manufacturing Chemists for Over 100 Years

Pfizer

CHAS. PFIZER & CO., INC.
Chemical Sales Division
630 Flushing Ave., Brooklyn 6, N. Y.
Branch Offices: Chicago, Ill.; San Francisco, Calif.; Vernon, Calif.; Atlanta, Ga.; Dallas, Texas

BUYING SUPPLIES OFF THE SHELF...

...OR ORDERING A COMPLETE RIG READY TO DRILL

You get Proven Quality . . . Proven Service from MID-CONTINENT SUPPLY COMPANY

The new Mid-Continent field store at Anaco, Venezuela, is another step forward in better field service to the Venezuelan oil industry.

The trailer-mounted drilling rig shown above on location in Venezuela is an example of Mid-Continent service in supplying major drilling equipment around the world. Equipment supplied by Mid-Continent Supply Company for this highly portable, fully unitized rig includes a Unit Rig U-40 drawworks, Unit Rig three-engine compound rig drive, the trailer on which the drawworks and rig drive are mounted, and an Emsco D-850 slush pump.

Around the world "wherever there is oil" you can rely on Mid-Continent Supply Company for proven products and service.

EXPORT DIVISION: 45 Rockefeller Plaza, New York, N. Y. U.S.A.

MID-CONTINENT
Supply Company
MID-CONTINENT BLDG. • FORT WORTH, TEXAS

ANACO • CARACAS • MARACAIBO

THE WORLD'S LARGEST INDEPENDENT OIL FIELD SUPPLY COMPANY

THESE MIDWEST "LONG TANGENT" ELBOWS SAVED $4121 IN PIPE

MIDWEST "LONG TANGENT" ELBOWS COST NO MORE THAN OTHER ELBOWS

Here are 1227 Midwest "Long Tangent" Elbows (12", 14" and 16" standard weight) ready for shipment to a chemical plant. Each Midwest "Long Tangent" Elbow has a straight section on each end equal in length to ¼ the nominal pipe size. Thus a 12" elbow saves 6" of 12" pipe while a 16" elbow saves 8" of 16" pipe. It doesn't take long to save a lot of pipe and a lot of money . . . in this instance $4121.

But saving pipe is not the only advantage of Midwest "Long Tangent" Elbows. They often eliminate short nipples and their extra welds . . . save time and money in lining up and clamping pipe and fittings . . . slip-on flanges are more easily applied. For all the facts, write for Catalog 54.

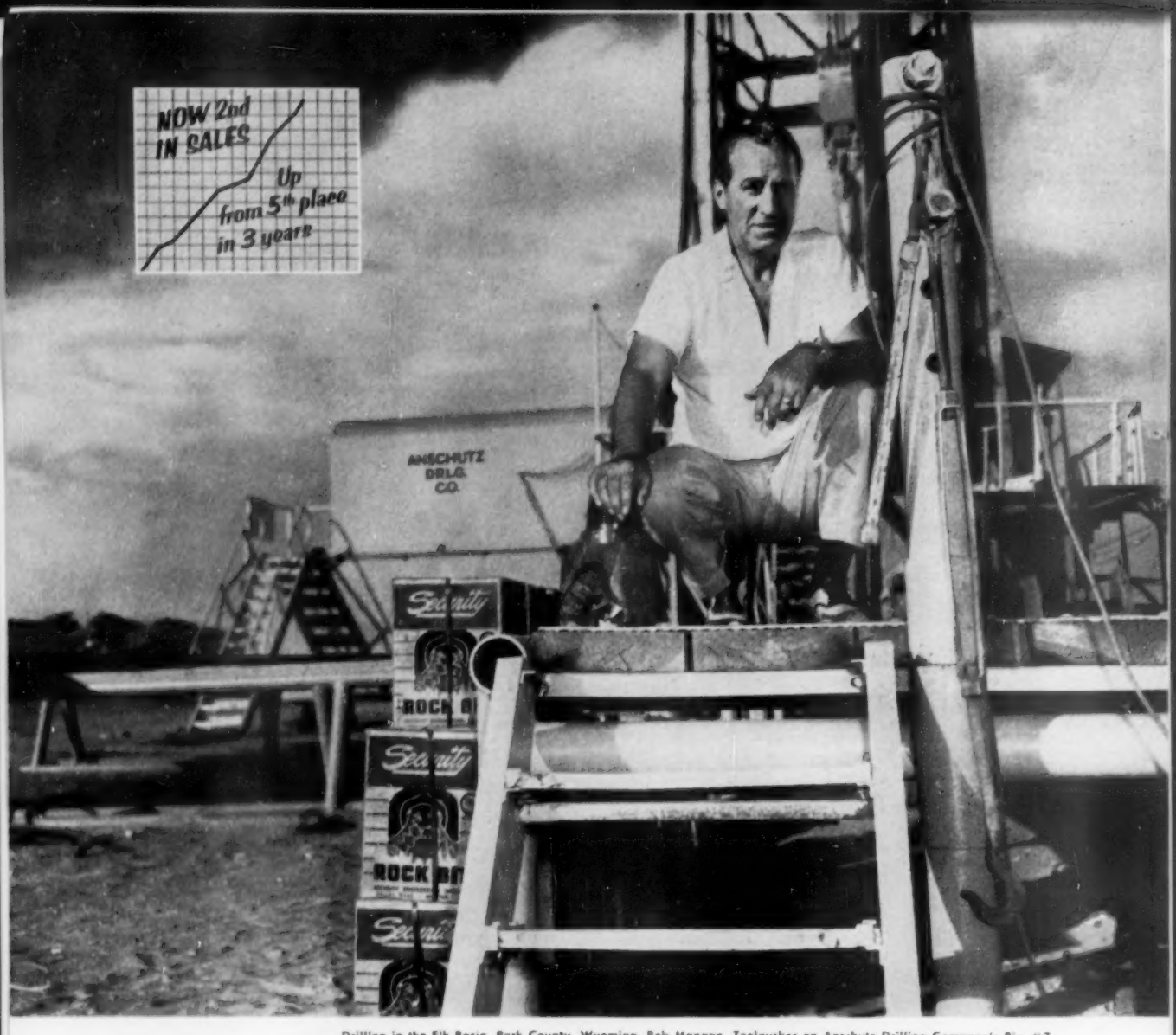
MIDWEST PIPING COMPANY, INC.
Main Office: 1450 South Second Street, St. Louis 4, Mo.
Plants: St. Louis, Clifton, N. J., Los Angeles and Boston

Sales Offices
New York 7—50 Church St. • Chicago 3—79 West Monroe St.
Boston 27—426 First St. • Los Angeles 33—520 Anderson St.
Houston 2—1213 Capitol Ave. • Tulsa 3—224 Wright Bldg.
Cleveland 14—616 St. Clair Ave. • Miami 34—2103 Le Jeune Rd.
STOCKING DISTRIBUTORS IN ALL PRINCIPAL CITIES

MIDWEST WELDING FITTINGS

MIDWEST WELDING FITTINGS Improve Piping Design and Reduce Costs

7055



Drilling in the Elk Basin, Park County, Wyoming, Bob Mangan, Toolpusher on Anschutz Drilling Company's Rig #7, proved to himself the superior performance of SECURITY rock bits by testing them against other leading bits.

TYPE FOR TYPE—SECURITY BITS PROVED BEST!

"Security Rock Bits have proved themselves better than any other bits I've used," says Bob Mangan, Toolpusher on Anschutz Drilling Company's Rig #7. "We recently compared *Security* with competitive bits on several Rocky Mountain locations. Type for type and size for size, *Security* dug faster, averaged more hole per bit, and came out looking better."

In the highly competitive oil well drilling industry, a little extra footage per bit — plus slightly greater penetration rate — can mean the difference between profit and loss. That's why progressive toolpushers like Bob Mangan test and compare leading brands of bits. They know you can't afford to be guided solely by tradition in the choice of rock bits. After all, the proof of rock bit performance is in the digging — not how long it has been on the market.

If your business is drilling oil wells — and you aren't already using *Security* bits — you owe it to your balance sheet to try *Security* on your next location. Give *Security* a fair trial on one hole, and you, too, will be convinced that *nothing outdigs Security*. Write for catalog.

Security ENGINEERING DIVISION

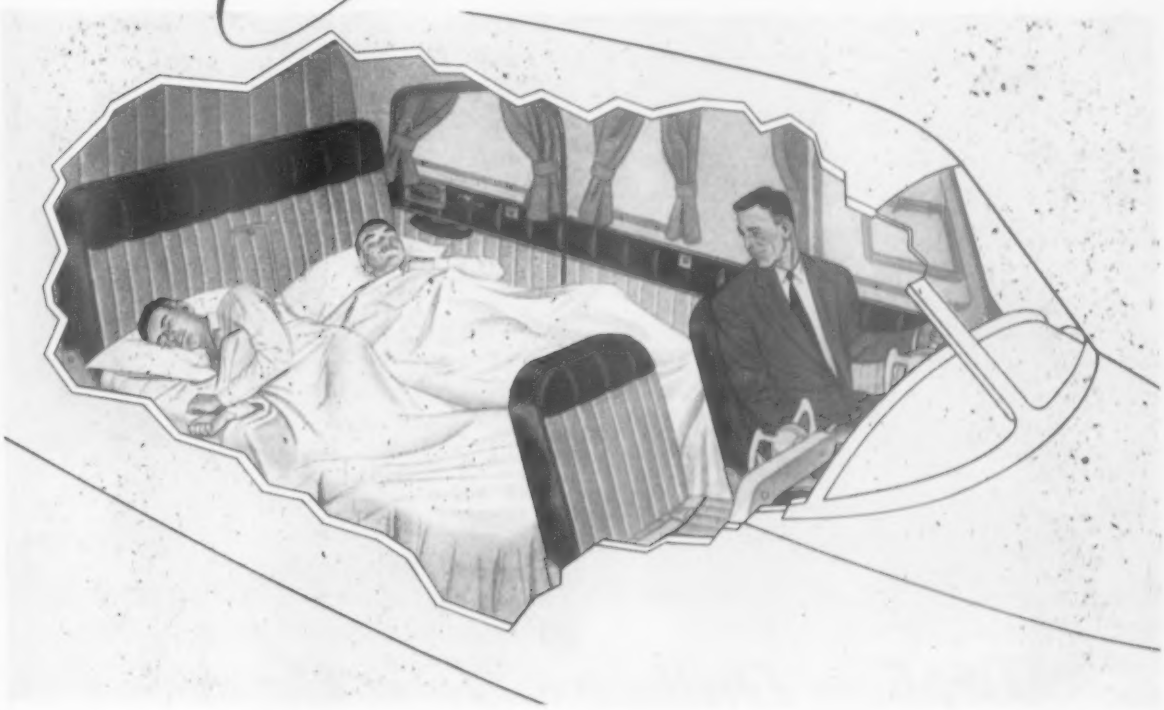
Dallas, Texas • Whittier, California

Export Office: Chanin Bldg., New York, N. Y.

ROCK BITS • REAMERS • CASING SCRAPERS • RUBBER STABILIZERS • HOLE OPENERS

IN BOTH GREAT

Commanders



"Room To Be Comfortable"

Twin-bed comfort is but one of the flexibility features made possible by longer, roomier cabins of both great Commanders. The optional hassock may be adjusted in seconds to provide a seat back, a chaise lounge or a comfortable bed for the flying executive.

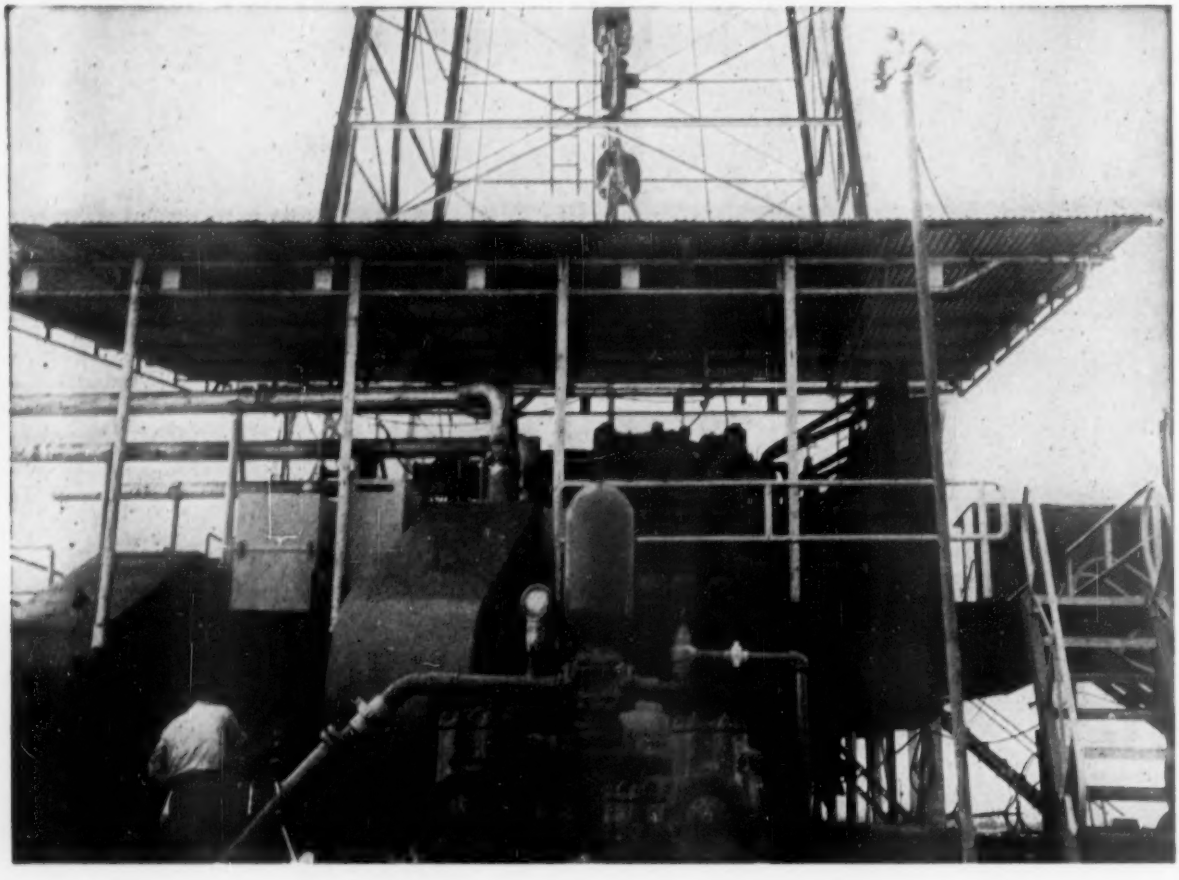
One Easy Step...

AERO Commander

560-A · 680-SUPER

Write For Catalog 120-A Write For Catalog 120-S

AERO DESIGN & ENGINEERING CO • TULAKES AIRPORT • P. O. BOX 118 • BETHANY, OKLAHOMA



Deephole Drilling . . . In a Hurry !

. . . the acceleration, lugging power, and dependability you get from Le Roi L3460 and L4000 engines mean faster round trips and lower drilling costs.

WHEN you have to go deep you need plenty of horsepower. And the place to get it is from Le Roi's L3460 with 600 max. hp. or its big brother, the L4000 with 655 max. hp.

You get much more, too. You get compactness. These V-12 overhead-valve engines are only 164 in. long. That makes them ideal for drill-rig installation, because they pack a lot of power in a small space — give you more horsepower per dollar.

But that's not all you get from these high-output engines. They represent the first, truly new design concept in 15 years. They have improved fuel economy; integral crankcase and cylinder construction for greater rigidity; longer bearing life; hydraulic valve lifters; better manifolding; husky crankshaft with integrally forged counterweights for unbelievably smooth operation — modern features that mean lightning response to load demands, outstanding performance and dependability.

Like all Le Roi engines, they're built to stand oilfield handling; they're easy to service; they have a wide speed range up to 1350 rpm; and they operate on natural gas, butane, or gasoline.

Ask your supply house or Le Roi distributor to show you an L3460 or L4000 at work. See for yourself why they can help you make hole faster. Literature is also available — just write us for it.

P-179

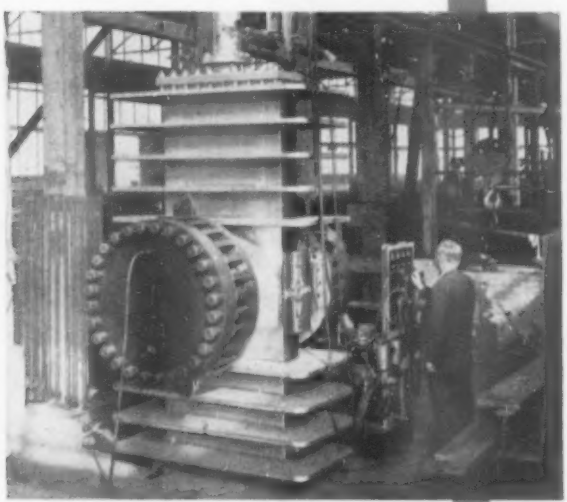
LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin

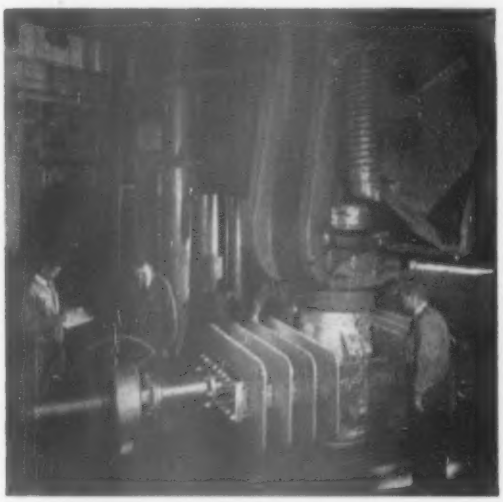
PORTABLE AIR COMPRESSORS · TRACTAIR · STATIONARY AIR COMPRESSORS · AIR TOOLS · ENGINES

• *the fabricated steel gate valve that's*

DESIGNED BUILT TESTED PROVED *for* PIPELINE SERVICE



34" full opening gas line valve being tested before shipment for free gate movement, bubble-tight seal.



24" full opening valve being subjected to 600-ton compression load. Gate maintained free movement.

THE WHOLE VALVE IS RIGHT HERE

When valve is full open or closed, bubble-tight seals on both sides of the gate completely isolate line pressure in the conduit. The body, serving merely as framework for operating mechanism and to prevent loss of product while gate is in motion, may be drained or vented to atmosphere when gate is open or closed. Integrity of seals can be checked any time by a tell-tale valve on the body.

Engineered and built specifically for pipeline service, every Grove Seal-O-Ring fabricated steel body is tested at *double its rated working pressure*. This subjects it to tension far greater than anything it might be expected to face in the field—and at the same time relieves any existing stresses in the body itself.

To check effects of extreme compression, a Grove 24" valve was recently subjected to a *600-ton* compression load, without benefit of internal pressure to offset any of the tremendous force. The gate remained completely free to open and close!

The full-floating gate and seats can be depended upon to maintain bubble-tight seal with pressure in either direction, even under severe conditions of line compression or stress.

These test results have been confirmed by experience of hundreds of users—in gas and liquid service—under the most grueling operating conditions.

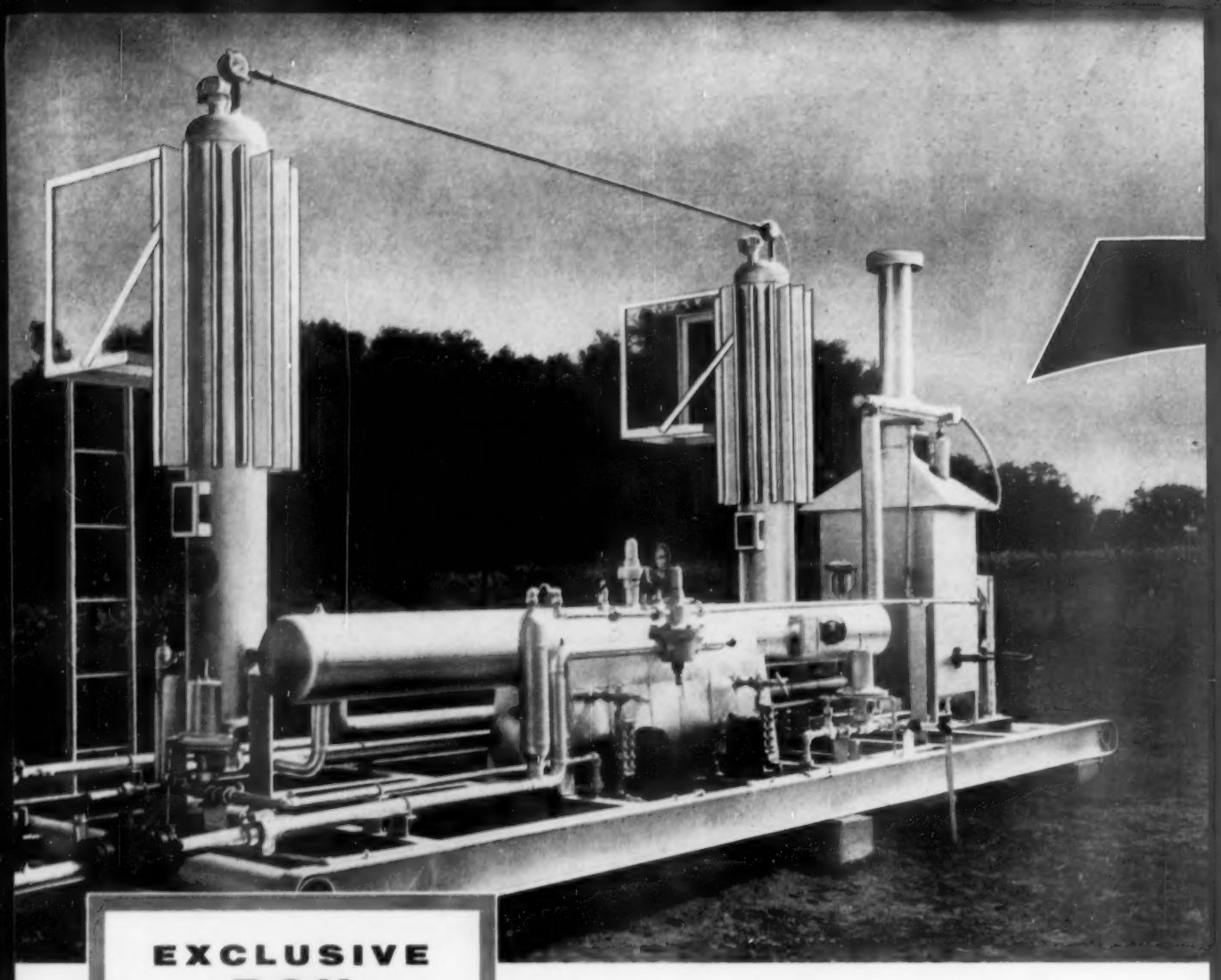
603

GROVE SEAL-"O"-RING Gate Valves

GROVE VALVE and REGULATOR COMPANY • 65th & Hollis Sts., Oakland 8, California
HOUSTON 4 — 1901 Calumet St. • • • • • • • • **LOS ANGELES 6** — 1930 W. Olympic Blvd.

ODESSA, TEXAS • TULSA, OKLAHOMA • DENVER, COLORADO • In Western Canada: GROVE VALVE LIMITED

GROVE SEAL RING GROVE SIMPLICITY ACCURACY SAFETY



EXCLUSIVE DAU FEATURES

INLET SEPARATOR attains a new high in liquid-gas separation in small space.

DEHYDRATION TOWERS achieve a new high level of desiccant efficiency.

REGENERATION GAS HEATER has only one half the heat loss of conventional heaters.

CONTROL VALVES are specially designed for this service and achieve absolute zero leakage.

REGENERATION GAS RATE CONTROL automatically adjusts gas flow to amount required instead of holding to a constant flow rate.

TOWER SWITCHING CONTROL. Heating, cooling and switching cycles are automatically controlled.

COOLING AND CONDENSATION OF REGENERATION STREAM. Heat exchangers, liquid traps and auxiliary cooling are not required.

VESSELS AND PIPING. The conventional mass of large, high pressure piping and valves is not required.

...A NEW CONCEPT IN GAS DEHYDRATION THAT PAYS A PROFIT WHILE SAVING MONEY

More saving results from its lower operating costs. The DAU Weldrier uses less than a third as much desiccant as similar dehydrators of similar capacity —only 20% as much fuel gas. This fuel gas saving can amount to hundreds of dollars per month.

* DYNAMIC ADSORPTION UNIT

BRING YOUR DEHYDRATION PROBLEMS TO PARKERSBURG

The three years of development work on the DAU Weldrier, has enabled us to accumulate a wealth of information on natural gas dehydration. This experience enables us to solve your dehydration problems most effectively with a DAU Weldrier. Ask your Parkersburg Representative to give you complete details.

Parkersburg DAU WELDRIER

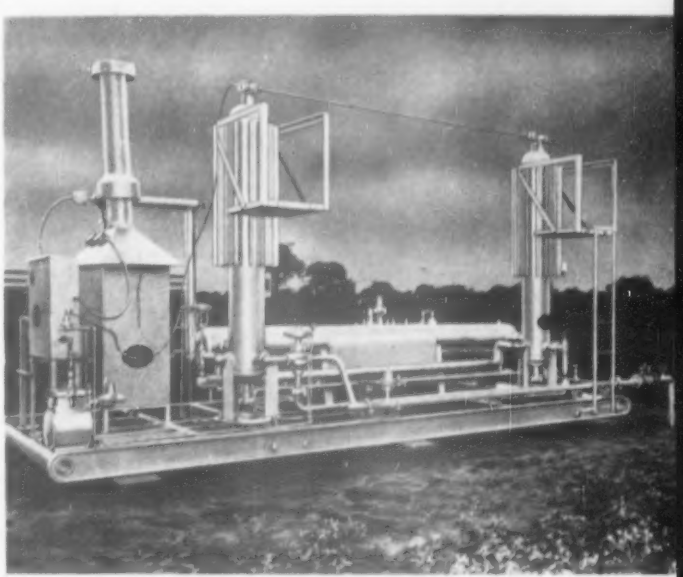
stops corrosion at its source ....the wellhead

Now, for the first time, you can dehydrate natural gas at the wellhead. Removal of vapor water at this point eliminates corrosion and hydrate trouble from the gathering system, as well as along the entire pipeline.

The compact Parkersburg DAU Weldrier can be sized to provide the exact amount of dehydration required for each well. You avoid the trouble and expense of an oversized or undersized central unit. You eliminate the necessity of shutting down all production in case a central unit is down—individual wellhead DAU Weldriers can be serviced without taking other wells off production.

You can afford the advantages and efficiency of individual wellhead Weldriers because they require no auxiliary equipment such as separators, valves, piping and costly hookup time. They are completely unitized and skid mounted—require only four connections to go on stream.

Protect your entire natural gas gathering system, as well as the pipeline, against corrosion and hydrate trouble. Install Parkersburg DAU Weldriers at the wellhead.

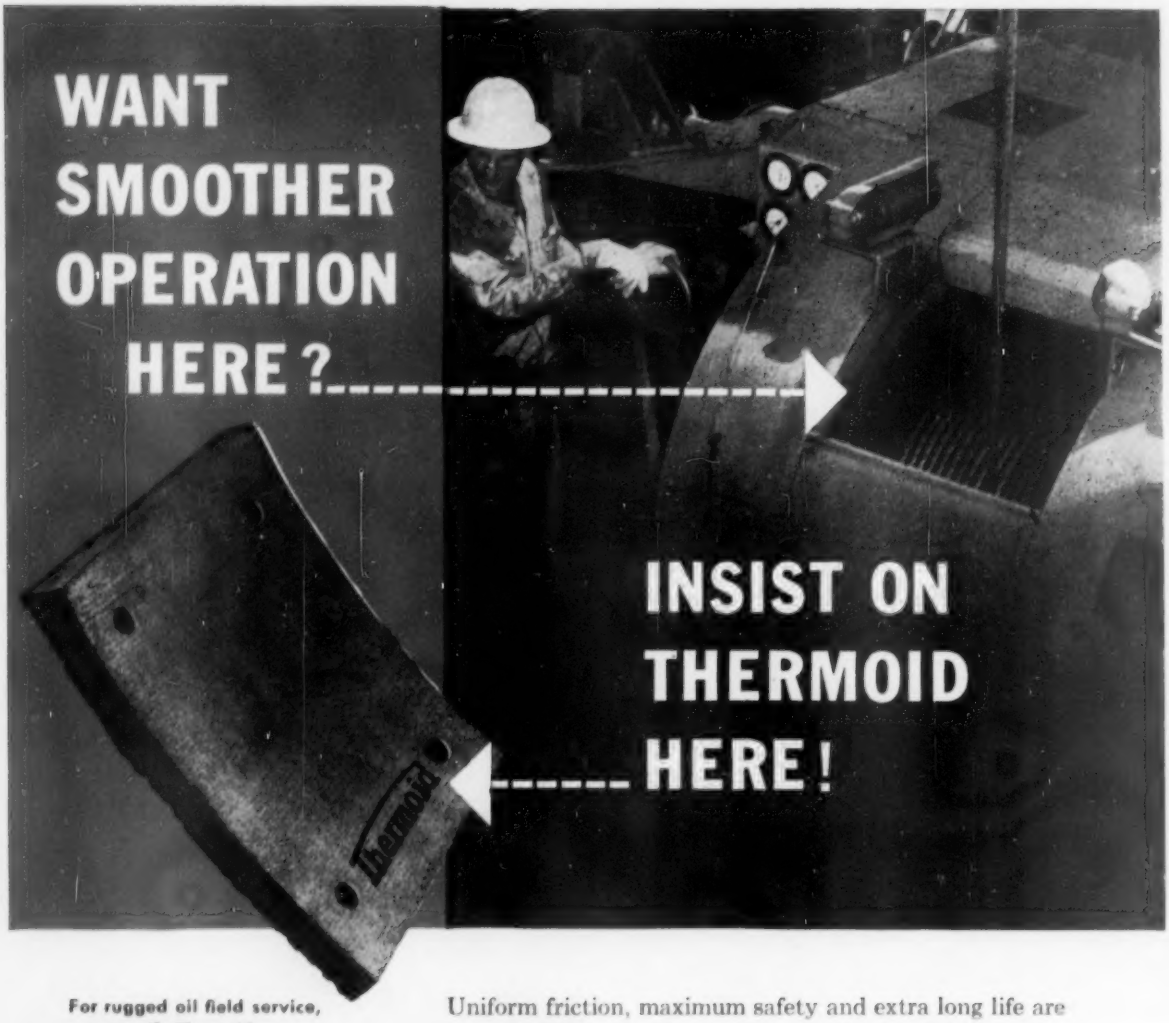


Parkersburg
RIG AND REEL COMPANY
DIVISION OF PARKERSBURG : AETNA CORPORATION

3345 WINTHROP AVENUE
FORT WORTH 16, TEXAS

5629

WANT SMOOTHER OPERATION HERE?



INSIST ON THERMOID HERE!

For rugged oil field service, *specify Thermoid...*

...Powerflex Rotary Hose

...and Multi-V Belts.

Uniform friction, maximum safety and extra long life are literally built into Thermoid Brake Blocks. Solid woven asbestos tape (no plies) assures smoother operation and high braking capacity. There's no crumbling or loss of shape—even in highest operating temperatures.

Thermoid's special resins won't bleed or leave residue on drums. Split-type sleeve prevents "chucking." And, because the braking surface is pre-ground to accurate limits, no running in is required.

No wonder Thermoid Brake Blocks are the choice of leading drilling contractors and original equipment manufacturers. You won't find a better Brake Block!

Warehouses:
Houston, Texas
Oklahoma City, Okla.
Casper, Wyo.
Nephi, Utah
Los Angeles, Calif.

Thermoid

Thermoid Company
Offices and Factories
Trenton, New Jersey • Nephi, Utah

STRONGER and SAFER for every high pressure pipeline duty...

...because they are **drop forged by Vogt**

Send for Catalog F-9

Constantly imitated but never duplicated, Vogt drop forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-9 for our complete line of fittings and flanges.

For a copy of Vogt Catalog F-9 address Dept. 24FO.

HENRY VOGT MACHINE CO., P.O. BOX 1918, LOUISVILLE 1, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va., Cincinnati, San Francisco

OTHER VOGT PRODUCTS

Drop Forged Steel Valves — Petroleum Refinery and Chemical Plant Equipment — Steam Generators — Heat Exchangers — Ice Making and Refrigerating Equipment.

Vogt

DROP FORGED STEEL

Fittings and Flanges

This is Why the Nash is the Most Simple Compressor

It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

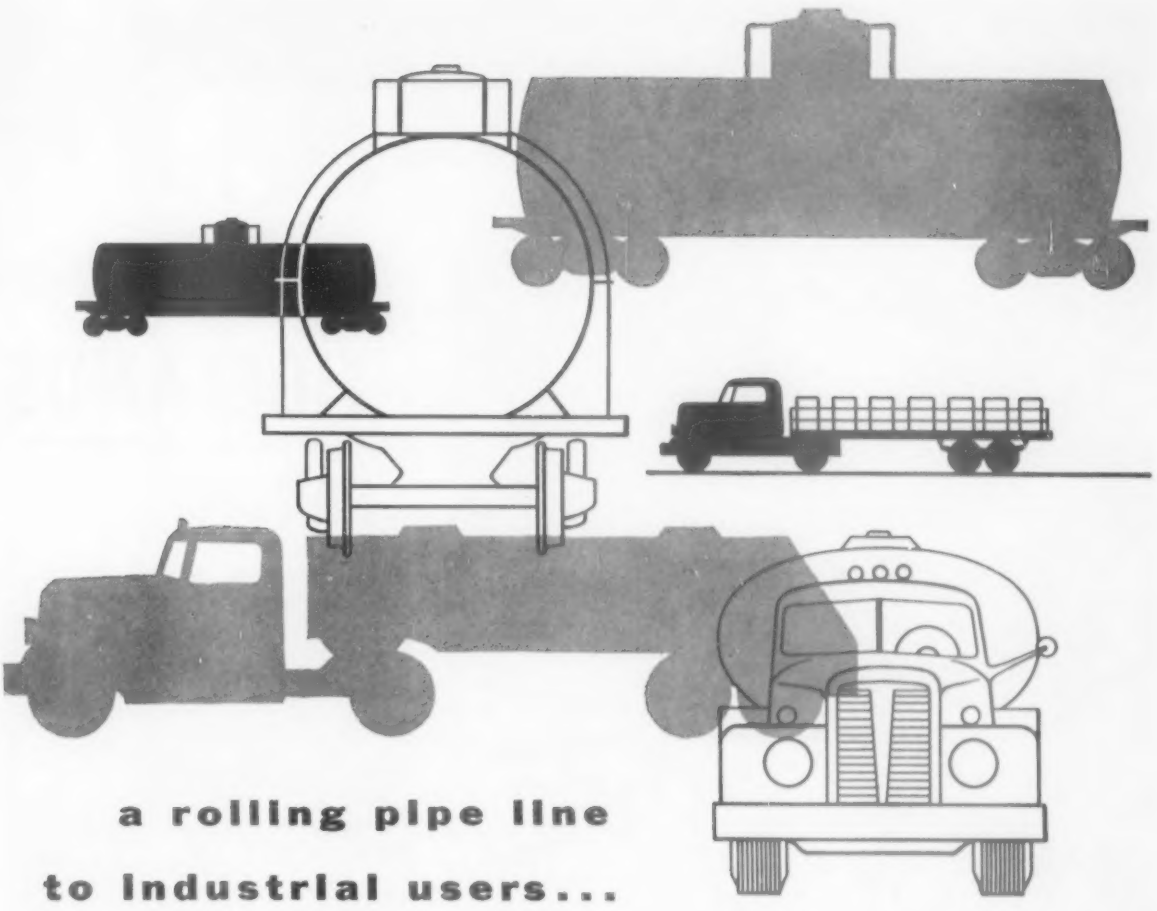
The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods Data on these pumps sent immediately on request

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.



a rolling pipe line

to industrial users...

Mathieson ETHANOLAMINES

direct to you...

Fast deliveries, straight from plant to you, guarantee that Mathieson mono-, di-, and triethanolamine reach your process in the original containers. There's no repacking or rehandling to impair the purity of these Mathieson products.

Tank car, tank truck, and drum shipments arrive directly from our modern Doe Run plant at Brandenburg, Kentucky; LCL deliveries, in plant packaging, from numerous local distribution points. For technical information and samples, call an Olin Mathieson representative today.

MATHIESON

MATHIESON CHEMICALS
OLIN MATHIESON CHEMICAL CORPORATION
INDUSTRIAL CHEMICALS DIVISION • BALTIMORE 3, MD.

3955

INORGANIC CHEMICALS: Ammonia • Bicarbonate of Soda • Carbon Dioxide • Caustic Potash • Caustic Soda • Chlorine • Hydrazine and Derivatives • Hyprochlorite Products • Muriatic Acid • Nitrate of Soda • Nitric Acid • Soda Ash • Sodium Chlorite Products Sulphate of Alumina • Sulphur (Processed) • Sulphuric Acid • ORGANIC CHEMICALS: Ethylene Oxide • Ethylene Glycols Polyethylene Glycols • Glycol Ether Solvents • Ethylene Dichloride • Dichloroethylether • Formaldehyde • Methanol • Sodium Methylate • Hexamine • Ethylene Diamine • Polyamines • Ethanolamines • Trichlorobenzene • Polychlorobenzene • Trichlorophenol

PIPELINE News from L·O·F GLASS FIBERS COMPANY

BLUE FLAG PROTECTS TIDELANDS PIPELINE!

The ground was so wet that water had to be pumped constantly from the ditch by the well point system shown here. ▶

City engineers of Anacortes, Washington, were faced with the problem of laying over 24,000 feet of large-diameter water pipeline—most of it through wet and muddy tidelands, an extremely corrosive environment!

To assure complete protection, Engineers Carey and Kramer specified L·O·F Glass Fibers' Blue Flag reinforcing inner wrap for the pipe, which was wrapped by American Pipe and Construction Co., Portland, Oregon.

Blue Flag pipe wrap is made of special inert glass, which resists the action of soil chemicals. The strong, uniformly porous mat acts to give you:

- increased enamel strength
- high resistance to cracking and backfill damage
- improved enamel distribution with far fewer "holidays"
- years more pipeline life

. . . all this for less than ½% of your original pipeline investment. Be sure to specify Blue Flag for your over-the-ditch or yard-wrapped pipe. It's available from strategically located distributor warehouses. For full details, write: L·O·F Glass Fibers Company, Dept. 78-86, 1810 Madison Avenue, Toledo 1, Ohio.

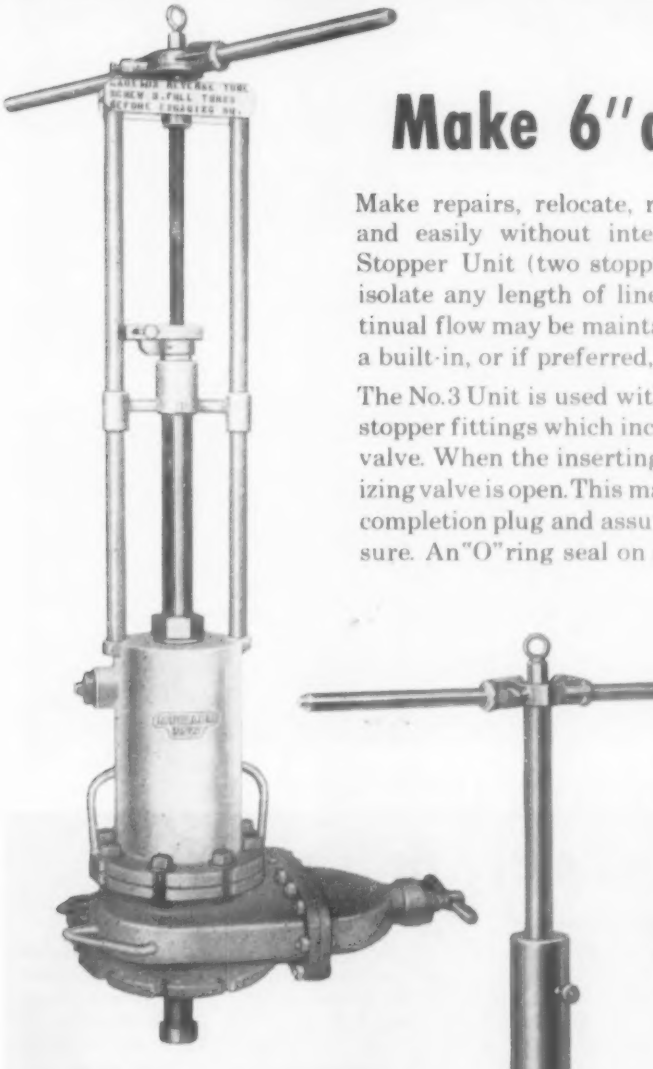
L·O·F GLASS FIBERS
BLUE FLAG PIPE WRAP

L·O·F GLASS FIBERS COMPANY
TOLEDO 1, OHIO

Makers of glass fibers by the "Electronic-Extrusion" process

A Complete Line for Pipeline Protection: BLUE FLAG Reinforcing Pipe Wrap • **DURAMAT** Protective Outer Wrap • **DURAMESH** Pipeline Fabric • **DURATAPE** Pipeline Joint Wrap

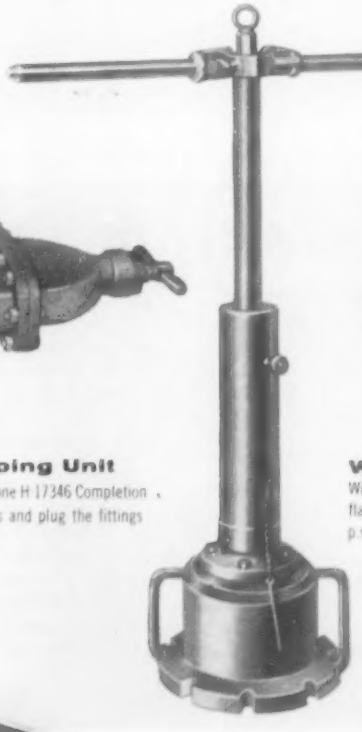
MUELLER®



Make 6" and 8" Stop-offs

Make repairs, relocate, replace or tie-in to 6" and 8" lines safely and easily without interrupting flow. The Mueller No. 3 Line Stopper Unit (two stopping machines) can be used to completely isolate any length of line section while it is under pressure. Continual flow may be maintained around the isolated section by using a built-in, or if preferred, a completely separate by-pass line.

The No. 3 Unit is used with Mueller welding or mechanical joint line stopper fittings which incorporate a completion plug with equalizing valve. When the inserting or extracting tool is being used, the equalizing valve is open. This maintains equal pressure on both sides of the completion plug and assures easy insertion or extraction under pressure. An "O" ring seal on completion plug prevents leakage of fluid.



No. 3 Line Stopping Unit
Two H-17340 Stopping Machines and one H-17346 Completion Machine are used to isolate sections and plug the fittings

Welding fitting
With 150, 300, 400 or 600 pound flanges for pressures to 1200 p.s.i. at 100°F. Sizes 6" and 8"

Mechanical joint fitting For cast iron or steel pipe where welding is not desired. Pressures to 175 p.s.i. at 100°F. Sizes 6" and 8".

Other line stopper units and fittings in sizes from ¾" through 12".

MUELLER NO-BLO PRODUCTS®

MUELLER CO.
Dependable Since 1857
MAIN OFFICE & FACTORY: DECATUR, ILLINOIS

an ACCO product

American Cable TRU-LAY VHS 15% STRONGER

For Deeper, Safer, Faster Drilling... New VHS Rotary Drilling Lines

No matter where you go, you'll find that more and more rigs are equipped with rotary drilling lines of new TRU-LAY VHS. Made from a new grade of steel for wire rope, new VHS is at least 15% stronger than IPS—the strongest grade available before VHS.

Drill Faster—Less Down Time

The greater strength of new VHS allows you to drill deeper before increasing the number of parts of line. And VHS's extra strength eliminates, in many cases, any necessity for buying new blocks or regrooving sheaves to use larger diameter lines for higher safety factors.

Higher Safety Factor

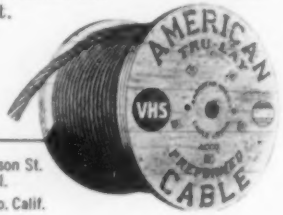
The safety factor for 10 lines of VHS is about equal to the factor of safety for 12 lines of IPS. Or the factor of safety for 10 lines of VHS is 14.9 or 15% higher than for 10 lines of IPS.

Resists Abrasion, Peening

New TRU-LAY VHS is tougher, too. Because it is stronger and tougher it has greater resistance to abrasion and higher resistance to peening—both important factors in maintaining shape and diameter. Ton-mile advantages should result if regular adaptable cut-off practices are followed.

Winch-Lines, Too

Winch-Lines of new TRU-LAY VHS are now available with all the advantages this stronger, tougher rope can bring to this grueling application. For Rotary Drilling Lines and Winch Lines of new TRU-LAY VHS . . . just call your nearest Mid-Continent Supply Store. You don't need any complicated specifications—just tell them the size and diameter you want.



For further information write to the nearest American Chain & Cable Company office listed at right for
Brochure DH-516H.

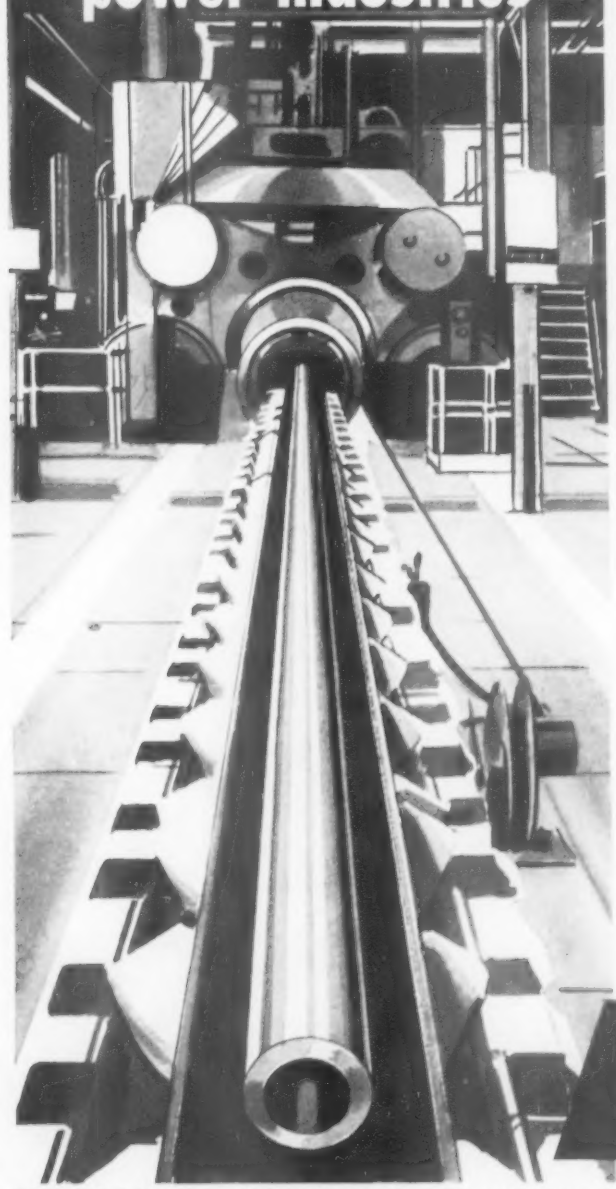
ACCO

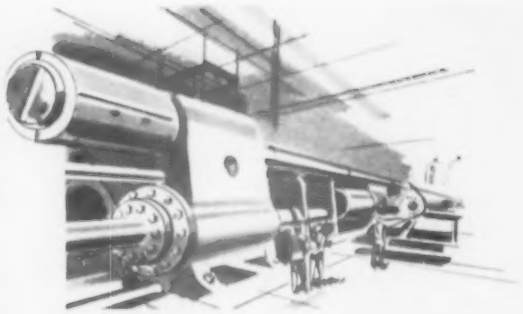
American Cable Division
AMERICAN CHAIN & CABLE

630 McFarland St., Houston 1, Texas | 4555 E. 46th Ave., Denver 16, Colorado | 2216 S. Garfield Ave., Los Angeles 22, Calif. | 400 W. Madison St., Chicago 6, Ill.

Wilkes-Barre, Pa.; Odessa, Texas; New York, N. Y.; Philadelphia, Pa.; San Francisco, Calif.

For longer life, higher performance in the petroleum, chemical and power industries





Corrosion-Resistant, Heat-Resistant EXTRUDED Steel Pipe

Curtiss-Wright's Metals Processing Division now offers the petroleum, petrochemical and power industries a line of high-quality, extruded steel tubular products to meet the most severe demands of modern processing. Inherent corrosion and heat-resistant properties of the steel alloys used are amplified by extrusion because the finished tube is produced with only one heat, in one pass of the giant 12,000 ton press . . . formed under compression in a matter of seconds without seams, in lengths up to 50 feet. Extra margins of resistance to corrosion and heat are built in easily by extruding heavier pipe wall thicknesses at no sacrifice in production speed. The most up-to-date quality control facilities, including ULTRASONIC TESTING, are employed in production.

Curtiss-Wright's extrusion facility is a specialty mill, ideally equipped for the production of special purpose, premium quality tubing. Conformance to A.S.T.M. specifications and other exacting standards is assured by an experienced engineering staff and the most modern metallurgical testing equipment.

When higher pressures and temperatures, or more corrosive service conditions demand more than the ordinary in large diameter pipe, let Curtiss-Wright serve you through the nearest Metals Processing Division Branch Office, or write to the Main Office address shown below.

81 Grider Street, Buffalo, New York

METALS PROCESSING DIVISION

CURTISS-WRIGHT CW

CORPORATION • BUFFALO, NEW YORK

ELECTRONICS • NUCLEONICS • PLASTICS • METALLURGY • ULTRASONICS • AVIATION

LQ600

NEW HIGH STANDARDS OF VALVE PERFORMANCE!

Fig. LQ600
150 Lb. S. P.
300 Lb. W. O. G.
200 Lb. S. P.
400 Lb. W. O. G.

L 256 39A

Wherever they're used, LQ600 Bronze Globe Valves are breaking long-standing service records and setting new performance standards of their own. Thousands of these valves have been in service for as long as five years without a failure or leakage—even on the most severe applications!

Now LQ600 Valves are available for a wider range of services than ever before . . . for pressure classes up through 200 lbs. steam and 400 lbs. water, oil, or gas . . . two complete lines in eight different sizes from ¼ to 2 inches.

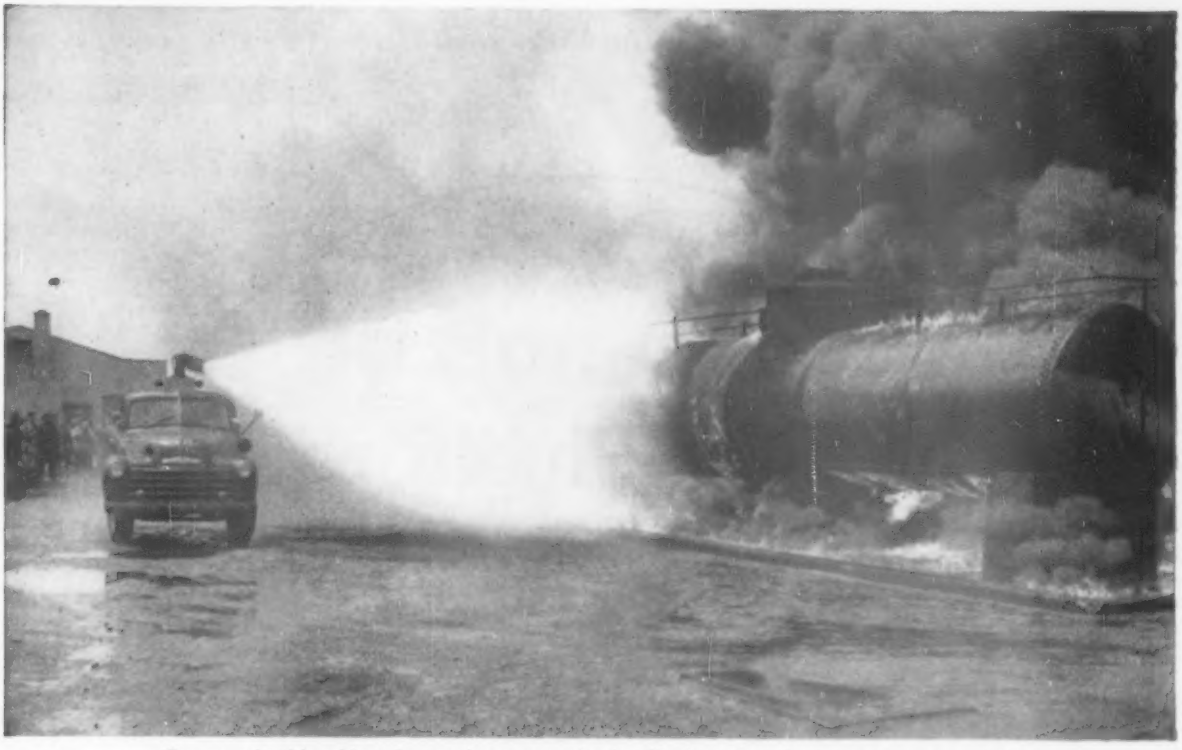
Write for literature, available from your Lunkenheimer Distributor, or from The Lunkenheimer Co., Box 360, Cincinnati 14, Ohio.

LUNKENHEIMER
L
QUALITY

BRINALLOY*
Seats and Discs
*Patented Alloy. T.M. Reg.

BRONZE • IRON • STEEL • PVC

LUNKENHEIMER®
THE ONE Great NAME IN VALVES



One man in this midget fire truck puts out the fire. Rockwood equipment makes it possible!

"Mighty Mite" puts out fire in 45 seconds

"Mighty Mite" is a swift fire fighter!

It was just a test, but the fire was real. Fuel in a pit under the tank car was set on fire. Fuel poured on top of the car from pipes was also ignited. The blaze was given a minute's start.

"Mighty Mite", loaded with Rockwood fire fighting equipment, went into action. The blaze was choked off in 45 seconds by Rockwood WaterFOG from Rockwood's Remote Manual Control Turret!

Rockwood equipment makes the small truck a big fire fighter. The Turret Nozzle does many jobs—discharges solid water stream, WaterFOG, FogFOAM, solid FOAM stream, "Wet" solid water stream, and "Wet" WaterFOG!

For complete details on this powerful Rockwood equipment send coupon below.

ROCKWOOD SPRINKLER COMPANY

Engineers Water . . . to Cut Fire Losses

Distributors in all principal cities

"Mighty Mite's" equipment includes: 4 stage centrifugal pump, 200-gallon booster tank, Rockwood Dual Suction Proportioning System for FOAM and "Wet", Rockwood Remote Manual Control Turret controlled from within the cab, Rockwood Ground Sweep Nozzles, Rockwood Remote Control Ball Valves, 2 hose reels with 200 feet of high pressure hose with new Rockwood High Pressure Handline Nozzle on each reel.

ROCKWOOD SPRINKLER COMPANY
Portable Fire Protection Division
1582 Harlow Street
Worcester 5, Mass.

Please send me your illustrated booklet on Rockwood fire fighting products.

Name .....

Title .....

Company .....

Street ..... *City* .....

Zone ..... *State* .....

toughest

Royal Blue rope
is made of the *toughest*
rope wire ever developed...
Roebling Type 1105

John A. Roebling's Sons Corporation, Trenton 2, N. J., Subsidiary of The Colorado Fuel and Iron Corporation BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6.

PETROLEUM CHEMICALS DIVISION
NEWS

August ★ One of a Series of Bulletins for the Petroleum Industry ★ 1956

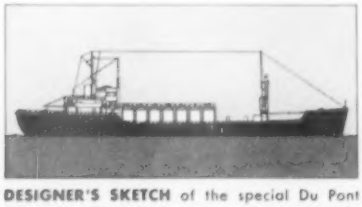
Major Du Pont expansions to serve TEL users in 1957

TEL TO BE TRANSPORTED BY TANKER FOR FIRST TIME

New Installation at Beaumont Insures Ample Supply at all Times

There will be *three* major distribution points for Du Pont TEL by the first of the year. A new tanker-supplied storage and delivery terminal is now being built in Beaumont, Texas. This new facility will offer the same delivery service and assurance of dependable supplies as the two Du Pont TEL manufacturing plants at Carney's Point, N. J. and Antioch, Calif.

The Beaumont terminal will be supplied from Du Pont's Chambers Works plant by a specially-designed tanker. Her initial TEL cargo will mark the first time tetraethyl lead compounds have been transported over water in bulk.



DESIGNER'S SKETCH of the special Du Pont TEL tanker. The cylinders you see in the midship section are for TEL. The ship will be painted a distinctive green and yellow.

In addition to this terminal, the Du Pont Petroleum Chemicals Division maintains a sales office, regional laboratory and warehouse in Houston . . . offering full additives service for refiners in the Gulf Coast area.

***THIS MAP SHOWS** that Du Pont facilities for serving TEL customers are located close to the major refining areas.*

ADDED SUPPLY FOR WEST COAST REFINERS

New California TEL plant to be in production by end of this year

Already more than 50% completed, the new Du Pont tetraethyl lead plant at Antioch, California, is expected to go on stream before the end of 1956. So if you operate a refinery on or near the West Coast, you can plan on a handy source of supply for your TEL requirements next year.

OVER

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

CONTINUED

New Plant

The new plant is located approximately two miles east of Antioch on the San Joaquin River. This makes it readily accessible to both water and rail transportation. Added to existing Du Pont facilities, the new plant will for the first time provide West Coast refiners with TEL that is West Coast-*made*. The plant will enable us to give nearby customers the fastest possible delivery service, with ample stocks always on hand.

Modern design

The latest technical advances in tetraethyl lead manufacture have been incorporated into the design and equipment—making it the most modern TEL plant in the world.

Expanding need

Due to the rapid expansion of the West Coast refining industry, there is a definite need for the new California plant. It will supply refineries in California, Oregon, Washington, Arizona, Nevada, Idaho, Montana and British Columbia.

Architect's sketch of the new Du Pont TEL and "Freon" plants at Antioch, California.

Integrated facilities

Added to the present Du Pont Petroleum Chemicals Division regional laboratory at El Monte and sales offices in Los Angeles, San Francisco and Seattle, the new TEL production facilities at Antioch will mean completely coordinated facilities for manufacturing and servicing the area's needs for TEL.

Sharing the same site is a new plant for making Du Pont "Freon"* refrigerants and propellents. This plant is now practically completed.

The Antioch plant will become an important new consumer of local materials, and when completed, the new Du Pont TEL facilities alone will provide production jobs for 215 employees. Most of them will be hired locally.

**Registered trademark*

WEST COAST MEDICAL SUPERVISOR

LAWRENCE A. GERLACH, M. D., is stationed at Antioch, Calif., in charge of the various Du Pont medical services in connection with the manufacture and distribution of tetraethyl lead in the Western Region.

He joined the medical staff of the Du Pont Company in 1947 and was assigned to the Petroleum Chemicals Division. Recently, due to the increasing refining activity and demand for TEL along the West Coast, he was transferred from Wilmington and stationed in this area. Prior to World War II, he was engaged in private medical practice in New York City and also served as Flight Surgeon, U. S. Naval Reserve.

In 1940 he joined the U. S. Army Air Corps Reserve as a pilot. He was called to active duty as a test pilot, in which capacity he served throughout World War II. He was returned to inactive duty with the rank of Lt. Colonel in 1947.

Dr. Gerlach was awarded the Air Medal and Distinguished Flying Cross for his military service. He is a Fellow of the American Medical Association and also holds a Fellowship in the Industrial Medical Association.

He is co-author of the book, "Maintaining Hygiene in TEL Operations."

LAWRENCE A. GERLACH, M. D.

Nationwide Du Pont TEL storage and delivery facilities serve refiners

To assure you of an ample supply of TEL compounds at all times, the Du Pont Petroleum Chemicals Division maintains—in addition to shipping facilities at the two plants and Beaumont—15 rail sidings and tank truck terminals.

These rapid-delivery facilities are conveniently located adjacent to the major refining areas of the country . . . at Ferndale, Washington; Port Costa (San Francisco), Torrance and El Monte, California; Salt Lake City, Utah; Houston, Corpus Christi, Chaison and Texas City, Texas; Kansas City, Missouri; East Chicago, Indiana; Minneapolis, Minnesota; Wood River, Illinois; Toledo, Ohio; and New Orleans, Louisiana.

Fast Service

Always on hand at all distribution points is an ample supply of both Motor and Aviation Mix. And there is someone ready at the phone to receive your order at any time of day or night.

Warehouses, too

For all Du Pont additives other than tetraethyl lead, we maintain fully stocked warehouses at Los Angeles, Houston, Billings, Montana; Kansas City, Missouri; Chicago and Carney's Point, New Jersey. Your orders can be filled promptly from any of these points — around the clock.

DU PONT

Better Things for Better Living . . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.) *Petroleum Chemicals Division* • *Wilmington 98, Delaware*

Sales Offices:

CHICAGO 3 — 8 So. Michigan Ave.	RAndolph 6-8630	PHILADELPHIA 2 — 3 Penn Center Plaza	LOcust 8-3531
CLEVELAND 14 — 1321 National City Bank Bldg.	MAin 1-6460	PITTSBURGH 22 — Room 751, 1 Gateway Center	ATlantic 1-2933
HOUSTON 2 — 705 Bank of Commerce Bldg.	CApitol 5-1151	SAN FRANCISCO 4 — Room 626, 111 Sutter St.	EXbrook 2-6230
LOS ANGELES 17 — 612 So. Flower St.	MAdison 5-1691	SEATTLE 3 — Room 215, 4003 Aurora Ave.	MElrose 6977
NEW YORK 20 — 1270 Ave. of the Americas	COlumbus 5-2342	TULSA 1 — P. O. Box 730, 1811 So. Baltimore Ave.	LUther 5-5578

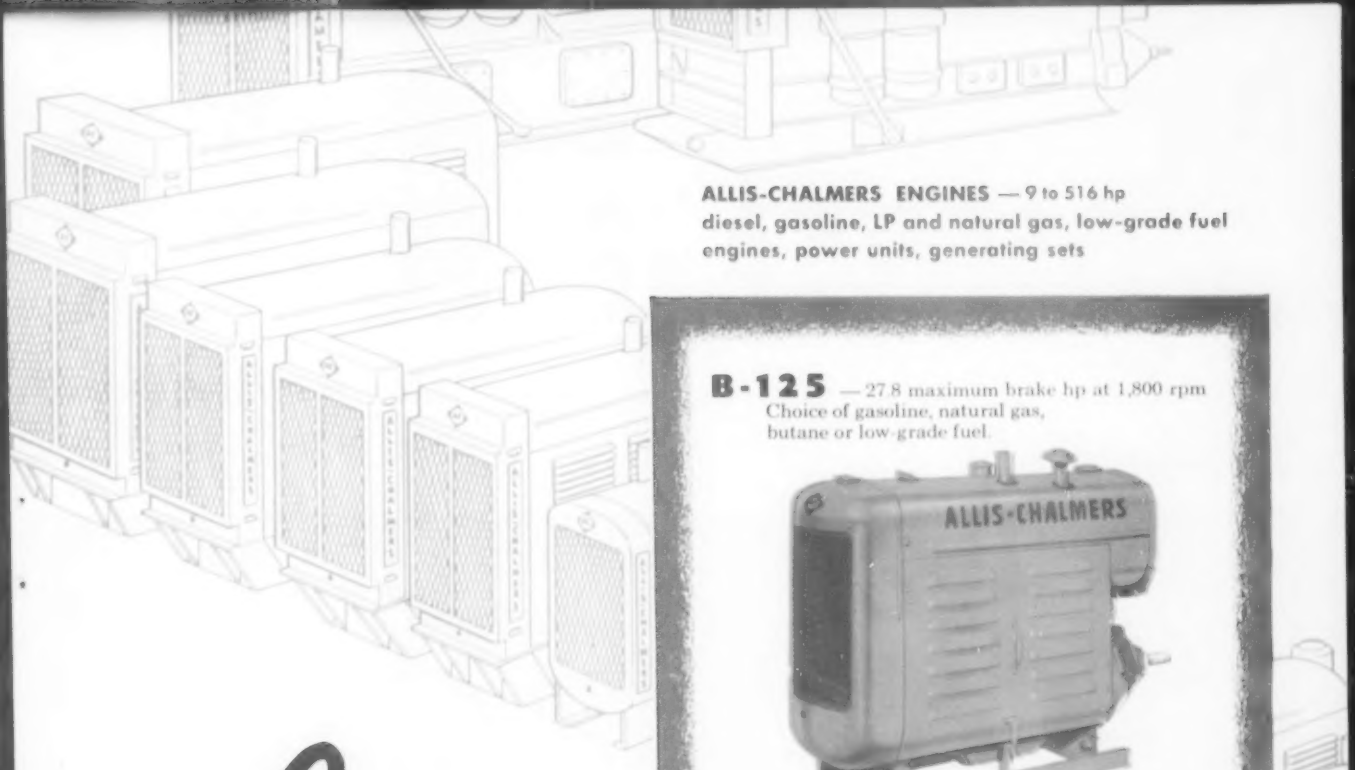
IN CANADA: Du Pont Company of Canada Limited—Petroleum Chemicals—85 Eglinton Avenue East—Toronto 12, Ontario—HUdson 1-6461

OTHER COUNTRIES: Petroleum Chemicals Division—Export Sales—Room 7496, Nemours Bldg.—Wilmington 98, Del.—OLympia 4-5121, Ext. 2962

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-2337

Printed in U. S. A.



ALLIS-CHALMERS ENGINES — 9 to 516 hp
diesel, gasoline, LP and natural gas, low-grade fuel
engines, power units, generating sets

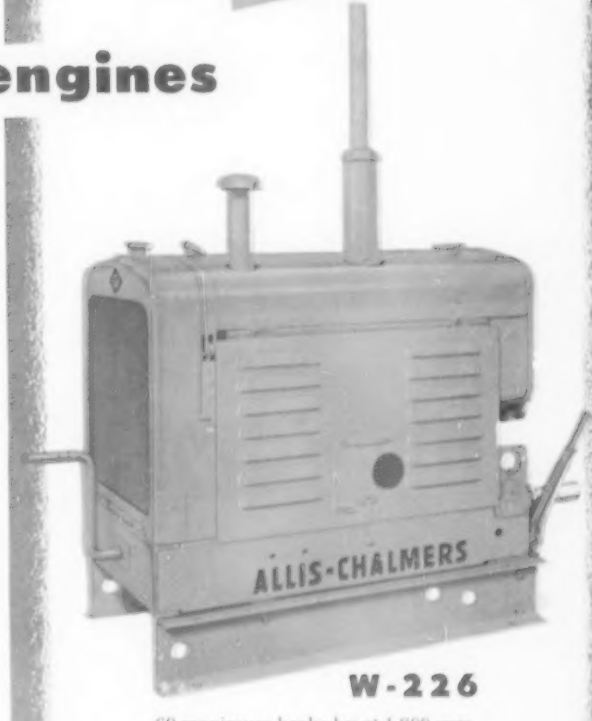
B-125 — 27.8 maximum brake hp at 1,800 rpm
Choice of gasoline, natural gas,
butane or low-grade fuel.

These 2 popular engines now available through ALL ALLIS-CHALMERS Oil Field Dealers

The B-125 and the W-226 now are included in the complete line available from *all* Allis-Chalmers engine dealers. This means these popular models now are more readily available to you. It also means that every engine, no matter where it is working, is close to a source of Allis-Chalmers True Original Parts and approved service.

Many thousands of Allis-Chalmers B-125's and W-226's are daily proving themselves in applications throughout the oil fields. Over the years, they have built up an outstanding reputation for economical, dependable performance on production pumping, core drilling, cementing, spudder work and driving generators.

Ask your Allis-Chalmers engine dealer to show you the popular B-125 and W-226 — or other sizes and types of modern engines to meet your needs.



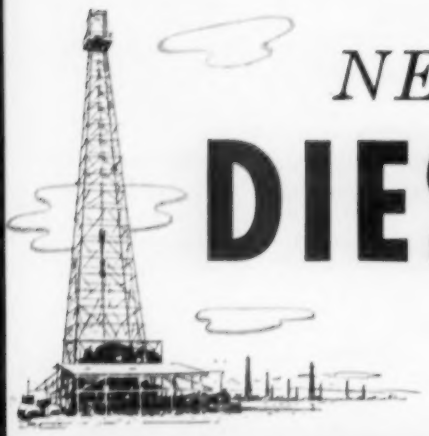
W-226

60 maximum brake hp at 1,800 rpm
Choice of gasoline, natural gas,
butane or low-grade fuel.

ALLIS-CHALMERS, BUDA DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

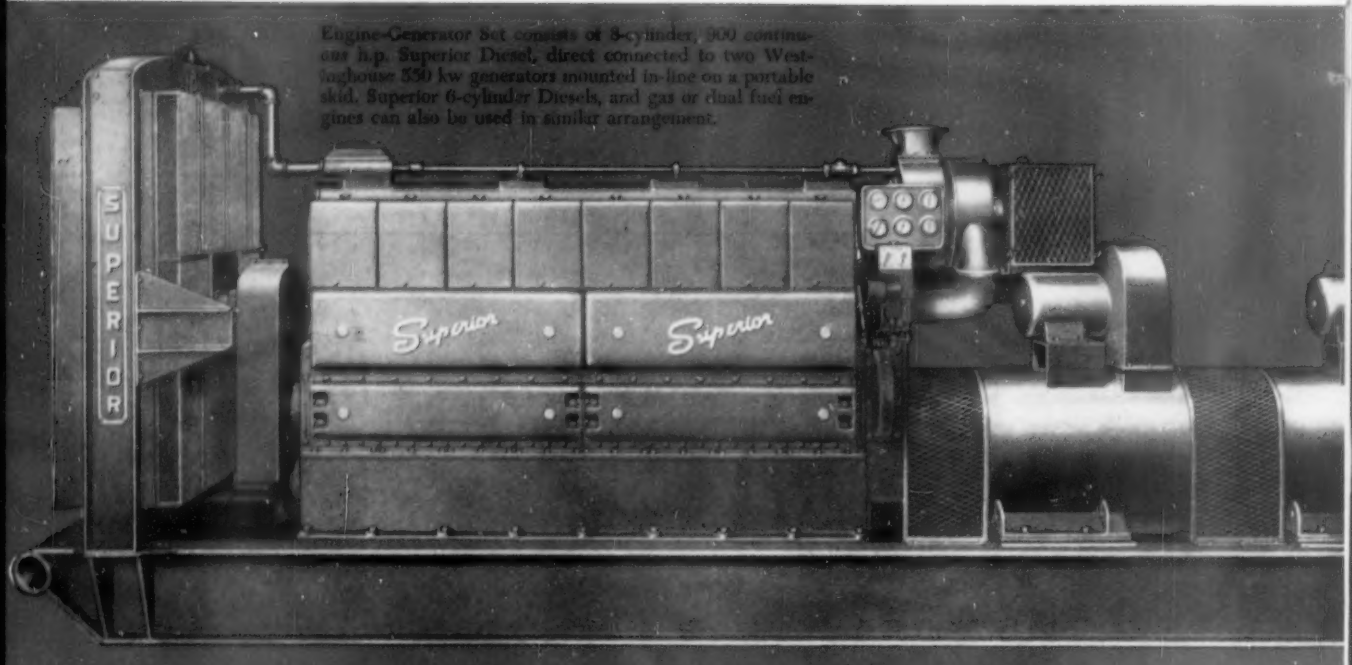
SO-2



NEW! White's simplified,

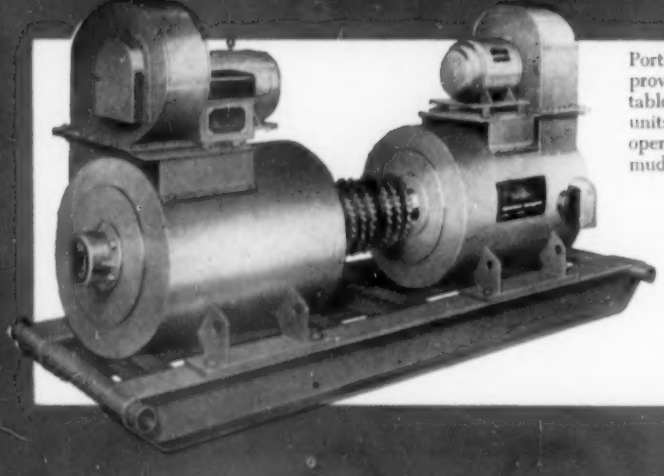
DIESEL-ELECTRIC

. . . for inland and

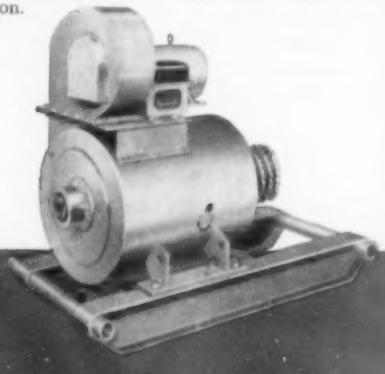


Engine-Generator Set consists of 8-cylinder, 900 continuous h.p. Superior Diesel, direct connected to two Westinghouse 550 kw generators mounted in-line on a portable skid. Superior 6-cylinder Diesels, and gas or dual fuel engines can also be used in similar arrangement.

NEW, LOWER COST, STANDARD,



Portable, skid-mounted, 1000 *continuous* h.p. drive motors provide power for mud pumps, drawworks and rotary table. A minimum of three drive motors are needed. Two units power mud pump operations . . . assuring continuous operation and guarding against complete loss of power or mud circulation.



lighter, more powerful

POWER PLANT

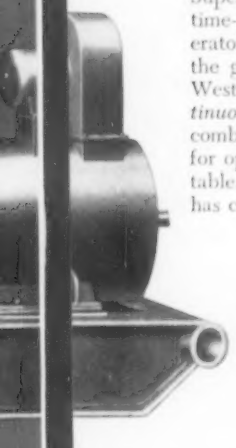
offshore drilling rigs

White's Superior Diesel-Electric Power Plant combines new, important advancements and design refinements to provide the utmost in simplicity of arrangement and operation . . . a more compact, lightweight package . . . and greater power for deep drilling!

The power plant consists of two or three engine-generator sets, a minimum of three drive motors, and simple operating controls. Each engine-generator set combines White's well-known, 8-cylinder, 900 *continuous* h.p. Superior Diesel oil field drilling engine, and a pair of time-proven, traction-type Westinghouse 550 kw generators. Rugged, flexible cables carry d.c. electricity from the generators to the heavy-duty, 6-pole, traction-type Westinghouse drive motors . . . rated at 1000 h.p. *continuous*, and 1250 h.p. intermittent output. Singly or in combination, drive motors provide dependable power for operation of the mud pumps, drawworks and rotary table. From an easily operated control console, driller has complete control of power for all rig operations . . . under any load and emergency drilling condition!

White's many design advancements include the direct connection of engine and generator . . . *eliminating need for clutch or gear box;* the use of standard production-line components . . . *allowing interchangeability of units or parts;* the development of greater horsepower . . . *using a minimum of 3 rugged, heavy-duty drive motors;* and the reduction of weight to make a compact, light-weight unit . . . *the total weight of the engine-generator set alone is almost 8 tons lighter than comparable units!*

In addition to outstanding design advancements, White's Diesel-Electric Power Plant gives you all the advantages of diesel-electric operation . . . flexibility of set-up at the rig, lower first costs and operating costs, greater portability, less weight, less rig-up time, and longer engine life! Get all the facts now in White's Bulletin 101. Get your copy from leading rig manufacturers, White's field representatives in all oil field areas, or through the White Diesel Engine Division.



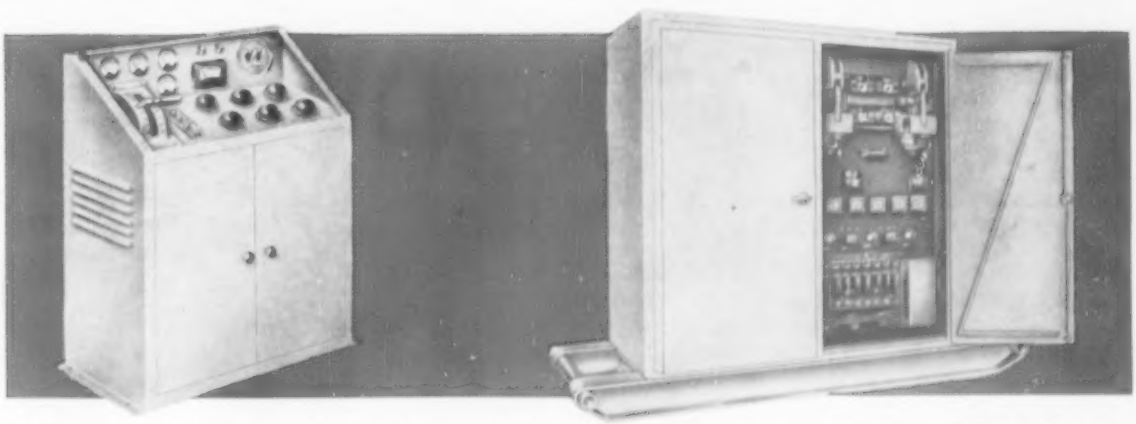
Superior ENGINES · ATLAS Imperial DIESEL ENGINES · White DIESEL

White diesel

WHITE DIESEL ENGINE DIVISION

The White Motor Company • Plant and General Offices . . . Springfield, Ohio

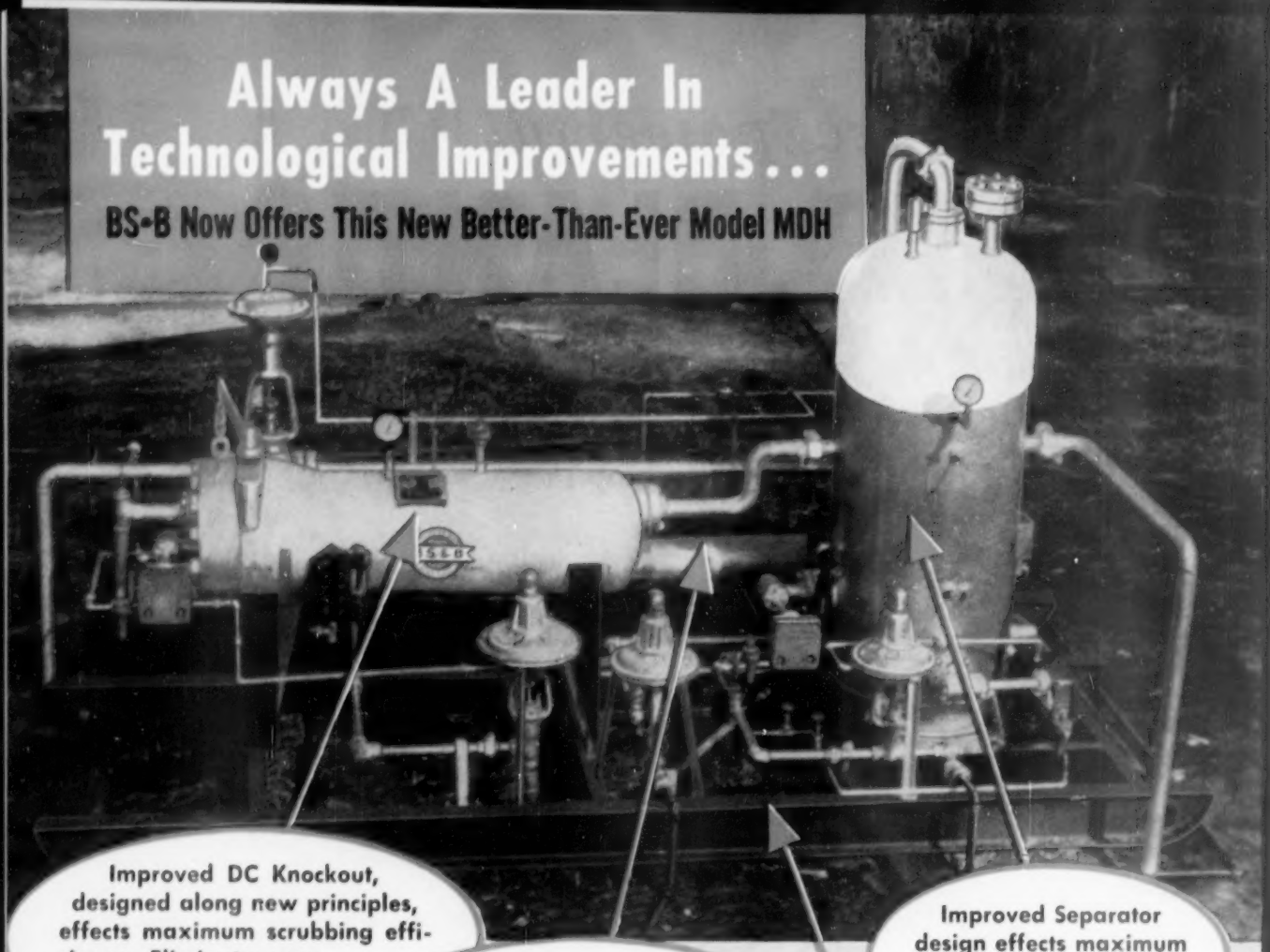
PRODUCTION-LINE COMPONENTS



Drillers controls may be conveniently arranged in this console-type stand, or they may be grouped in any arrangement or location desired. Electrical cabinet houses all electrical devices and apparatus.

Always A Leader In Technological Improvements...

BS&B Now Offers This New Better-Than-Ever Model MDH



Improved DC Knockout, designed along new principles, effects maximum scrubbing efficiency. Eliminates wax and salt water problems.

Efficient heat exchanger, designed specifically for this unit, achieves maximum cooling with minimum pressure drop through counterflow with cold sales gas.

Improved Separator design effects maximum separation of liquids, hydrates and gas.

Skid mounted in a compact assembly that permits shipment of the completely assembled unit. Field hook-up requires only four connections.

BS&B COLD-FRAC SYSTEM

No matter how good a new piece of BS&B equipment may be when first introduced, we are constantly seeking ways and means, born of our field experience and engineering know-how, to make it even better.

While other manufacturers are still offering the same low temperature separation systems they started out with, BS&B can now offer this proved *new* Model MDH COLD-FRAC System with improved features.

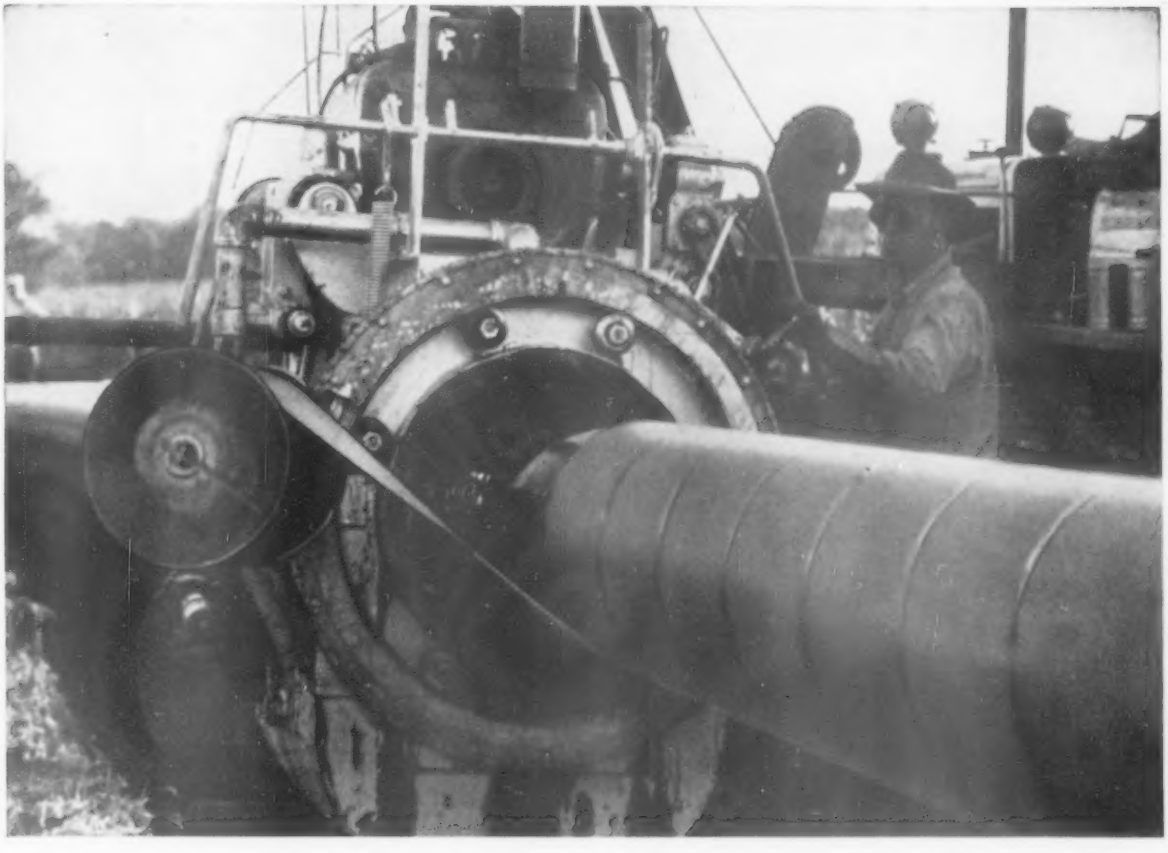
For the small lease operator, the BS&B ECON-O-MAX unit offers the same improved separator design as the larger MDH unit. Ask your BS&B Representative for details.

OVER 60 YEARS BS&B ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

BLACK, SIVALLS & BRYSON, INC.

Oil and Gas Equipment Division, Dept. 1-A8A

1708 West Main Street Oklahoma City, Oklahoma



"WE PREFER NO-OX-ID"

There are many reasons why NO-OX-ID has widespread preference among pipeline contractors, coating crews, independent applicators and utilities.

- NO-OX-ID saves on material, because less material coats more pipe per mile per day. Fewer "dope" kettles, trucks and "cats" are needed.
- NO-OX-ID is applied by hand, by Traveliner or at the mill.
- No irritating or noxious fumes with NO-OX-ID.

DEARBORN CHEMICAL COMPANY

Merchandise Mart Plaza • Chicago 54, Illinois

MAIL THE COUPON for booklet "Protecting Underground Pipe from Corrosion." It contains detailed information on NO-OX-ID and NO-OX-ID Casing Filler.

It pays to specify

***Dearborn* NO-OX-ID®**

For long-term pipeline protection

Dearborn NO-OX-ID CM Casing Filler

NO-OX-ID CM Casing Filler protects against corrosion wherever pipelines are cased beneath highways and railroad crossings. CM Casing Filler (1) contains additives, inhibitors, wetting agents; (2) displays water up to 5% of its own weight; (3) is applied at 150° F; (4) is an electrical insulator; (5) is economical to apply.

Dearborn Chemical Company
Merchandise Mart Plaza, Dept. OG, Chicago 54, Ill.

☐ Please send me booklet "Protecting Underground Pipe from Corrosion." ☐ Bulletin 3079 on NO-OX-ID CM Casing Filler.

Name .....

Title .....

Company .....

Address .....

City ..... *Zone* ..... *State* .....

Pumping Progress Report

FOR PETROLEUM ENGINEERS

An advertisement prepared by the Aldrich Pump Co., Member of Hydraulic Institute, U.S.A.

PUMP INSPECTION, MAINTENANCE AND REPAIR are jobs too frequently ignored in the design of production pumps. This has been verified by a survey of more than 15,000 pump installations. Speed and economy of maintenance was frequently quoted as a major factor in pump selection.

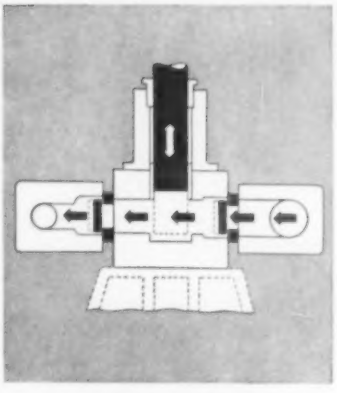
SECTIONALIZED FLUID-ENDS offer one of the best ways to guarantee both speed and economy in pump maintenance. As originated by ALDRICH Pump Co. Engineers, the Sectionalized Fluid-End comprises four main assemblies — the working barrel, suction manifold, discharge manifold and stuffing box.

SPEED IN MAINTENANCE is assured because of ease of accessibility of all wearing parts. Manifolds can be slid back on studs and valves removed as complete units. Split collar and flange connection of plunger to yoke permits easy removal of plunger.

ECONOMY OF MAINTENANCE results from speed in maintenance. Perhaps even more important is the simple fact that it is cheaper to replace a single section than a complete fluid-end. Another important economy is parts interchangeability. Among 3-, 5-, 7- and 9-plunger units of any series, wearing parts are interchangeable. Where a combination of multiplex pumps is required, this reduces spare parts stocks.

THE ALDRICH PUMP COMPANY is the originator of the DIRECT FLOW principle — a design innovation that utilizes the sectionalized fluid-end principle. Aldrich Engineers have become known as the people to take your tough pumping problems to. We have never turned down a challenge.

FURTHER INFORMATION can be had direct from the company. Tell us your problem and we'll send you Data Sheets describing the size pump we recommend to solve your problem. Address your request to: The Aldrich Pump Company, 9 Gordon Street, Allentown, Pa.



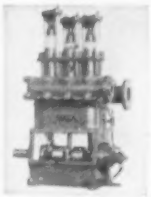
Aldrich Direct Flow Fluid-End Design

...for your tough pumping problems specify ALDRICH

The Direct Flow principle, an Aldrich design innovation, is a major forward step toward the solution of tough pumping problems of all kinds. Not only does it eliminate two right-angle turns in the fluid-end, but in addition makes possible complete Fluid-End Sectionalization. This is another Aldrich design innovation which permits economies of maintenance and repair offered by no other type pump.

CHECK THESE ADVANTAGES OF SECTIONALIZED FLUID-ENDS:

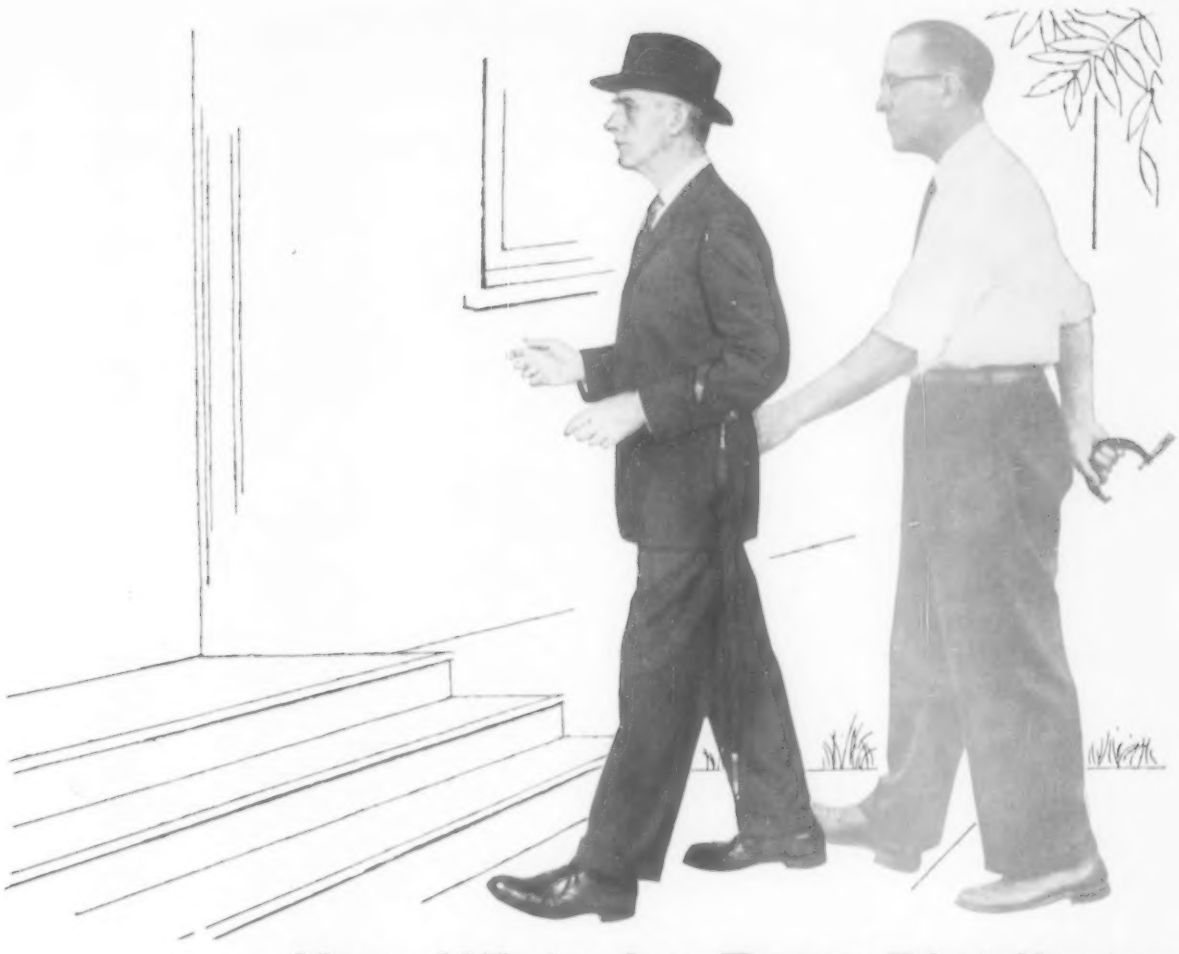
Less expensive parts replacement
Ease of inspection and maintenance
Interchangeable wearing parts
No special equipment for valve removal
Easily accessible stuffing boxes



Write today for Data Sheets describing the Direct Flow Pump Series.

THE ALDRICH PUMP COMPANY

Originators of the Direct Flow Pump
9 GORDON STREET
ALLENTOWN, PA.
Representatives in principal cities



Your Wickwire Rope Distributor and our die maker... ready to serve you

This die maker—one of the skilled technicians responsible for the quality of our rope wire—is with your Wickwire Distributor every time he makes a call.

True, he's physically in our plant, working to tolerances of 1/10,000 of an inch as he fashions the super-hard carbide dies used to produce every foot of rope wire. But, whenever your Wickwire Distributor makes his call, he has the full assurance that *every* wire in the product is exactly the size it should be and has a smooth, silky surface finish. This careful attention helps assure a rope which will perform successfully.

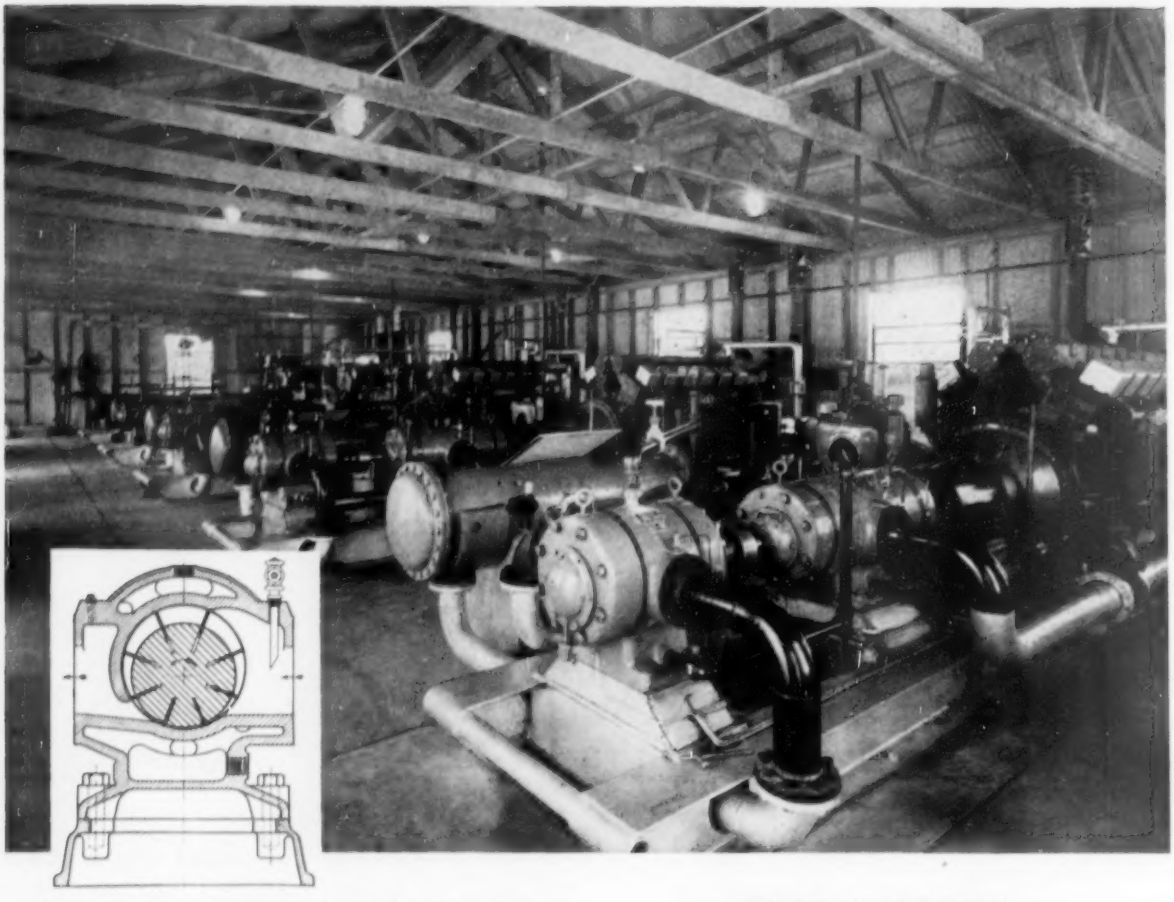
It's just one more reason why your Wickwire Distributor knows he's got top-quality rope, slings and strand to sell . . . and that these products will serve you well.

CF&I WICKWIRE ROPE A CF&I PRODUCT

4083

A PRODUCT OF THE COLORADO FUEL AND IRON CORPORATION

The "Inside" Story Of Fuller Rotary Compressors



Here, near Borger, Texas, is an installation of five two-stage Fuller Rotary Booster Compressors whose total capacity is 8,875,000 SCFD of casinghead gas compressing from 10 PSIG to 125 PSIG.

This same type of Fuller Rotary is used to boost gas into main booster stations and can be, and is, used where field pressures drop due to depletion. This latter use avoids expensive construction and increasing line sizes.

These, and other Fuller Rotary Compressors, now in widespread use throughout the petroleum industry, both indoors and out, incorporate trouble-free design that assures their dependability.

SIMPLICITY

The elimination of compressor valves, crankshafts, pistons and numerous other moving parts greatly reduces the need for attention, adjustment and replacement.

PULSATION—FREE FLOW

The smooth flow resulting from rotary compression eliminates pressure fluctuations and simplifies metering problems.

SUSTAINED PERFORMANCE

The blades are held out by centrifugal force, automatically compensating for wear, thus maintaining new-machine efficiency and/or capacity.

OPERATION WITHOUT VIBRATION

The rotary principle permits a compressor design completely free of reciprocating parts, thus avoiding the basic source of vibration.

The complete details, as well as sizes, of Fuller Rotary Compressors and Vacuum Pumps are available in Bulletin C-5A. We'd like you to have a copy. Send for it.

FULLER COMPANY, 132 Bridge St., Catasauqua, Pa.

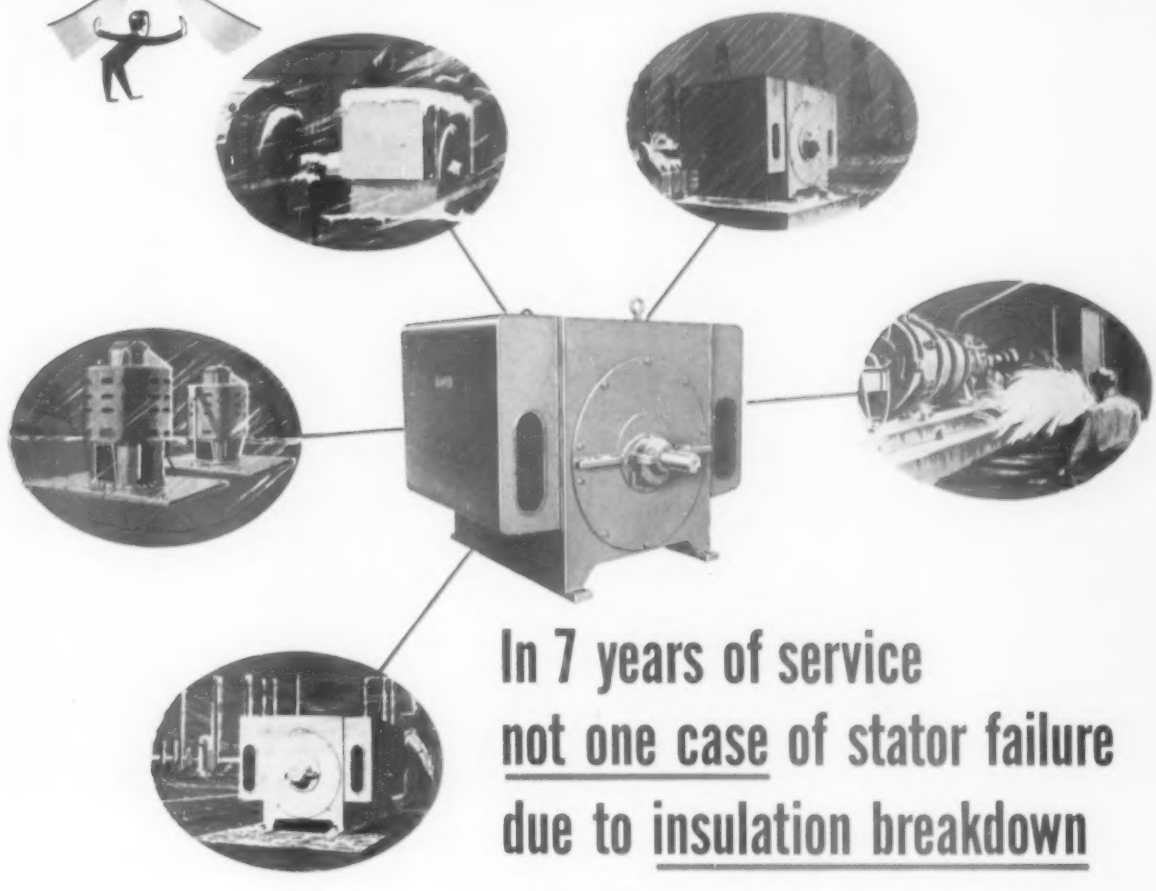
SUBSIDIARY OF GENERAL AMERICAN TRANSPORTATION CORPORATION

Chicago · San Francisco · Los Angeles · Seattle · Kansas City · Birmingham

C-289
3026

PIONEERS OF HIGH-EFFICIENCY VANE TYPE ROTARY COMPRESSORS SINCE 1930

LOOK BEHIND THE "INSULATION CURTAIN" BEFORE YOU SELECT A LARGE MOTOR



In 7 years of service not one case of stator failure due to insulation breakdown

● Merchandising alone doesn't "make" a motor. Fancy names, laboratory tests and "miracle formulas" don't mean a thing until actual, on-the-job service records back them up.

Elliott insulation in large, squirrel-cage induction motors has proved itself. Since 1948, when Elliott weather-protected motors first went on the job, *not one* motor has failed because of insulation troubles. This is the record chalked up by more than 1,400,000 hp of motors in service – 500,000 hp of them in rigorous outdoor service operating in extremes of dampness, rain, snow, sleet, hurricanes, tornadoes, oil fumes, salt spray, and many other unusual conditions. What better proof of motor insulation dependability can you ask for?

This "outdoor" insulation system has been so successful that it has been extended to the entire Elliott large induction motor line wherever possible. For details see your Elliott field engineer or write Elliott Company, Ridgway Division, Ridgway, Pa.

MODERN ELLIOTT COIL INSULATION... and winding treatment combines the latest in materials with the know-how and thoroughness of application to make them successful. Some highlights:

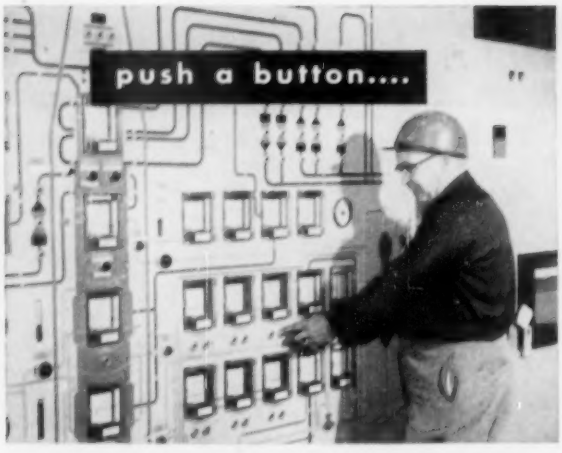
- Ground insulation combining the ageless and high temperature resisting characteristics of mica with the tough, flexible support of Mylar* backing.
- A permanently elastic insulating varnish.
- Vacuum-pressure impregnation for sure, complete penetration. (Completely wound stator is finally sealed by immersion in a specially suited insulating varnish.) Bulletin PB 1400-4 tells the whole story. Write for a copy.

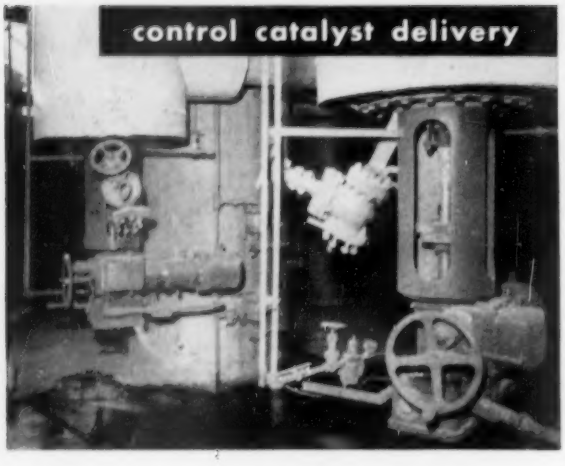
*Dupont Trademark

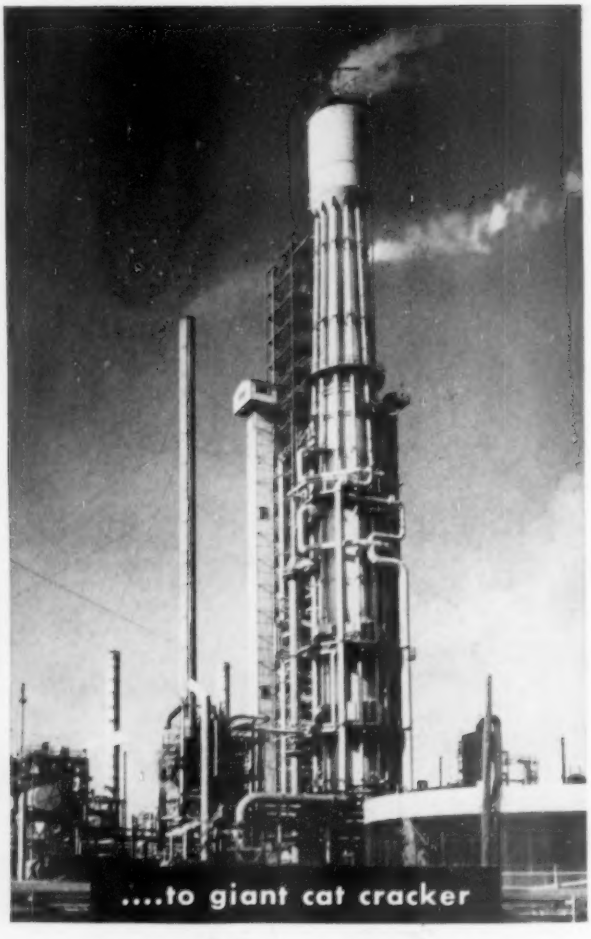
RG-8

ELLIOTT Company

Elliott large motor insulation is "field-proven"







Limitorque® Valve Controls Maintain Constant Catalyst Flow in Sun Oil's New Houdriflow Unit at Marcus Hook

To process more than 50,000 gallons of hot oil, 700 tons of cracking catalyst is delivered per hour to the top of this 350 ft. reactor. Limitorque valve operators open and close specially designed mixer valves, maintaining uniform flow of the air-blown catalyst through 12 pneumatic lift pipes. The Limitorque units are actuated by remote, push-button controls at a central control room panel.

Accurate regulation of catalyst flow is vital to the catalytic cracking process. Limitorque valve controllers are handling the job efficiently and effortlessly.

Limitorque motor-operated valve controllers may be actuated either remotely or manually, to open and close all types of valves. They are readily adapted to microwave control. Wherever valve operation is important . . . look to Limitorque.

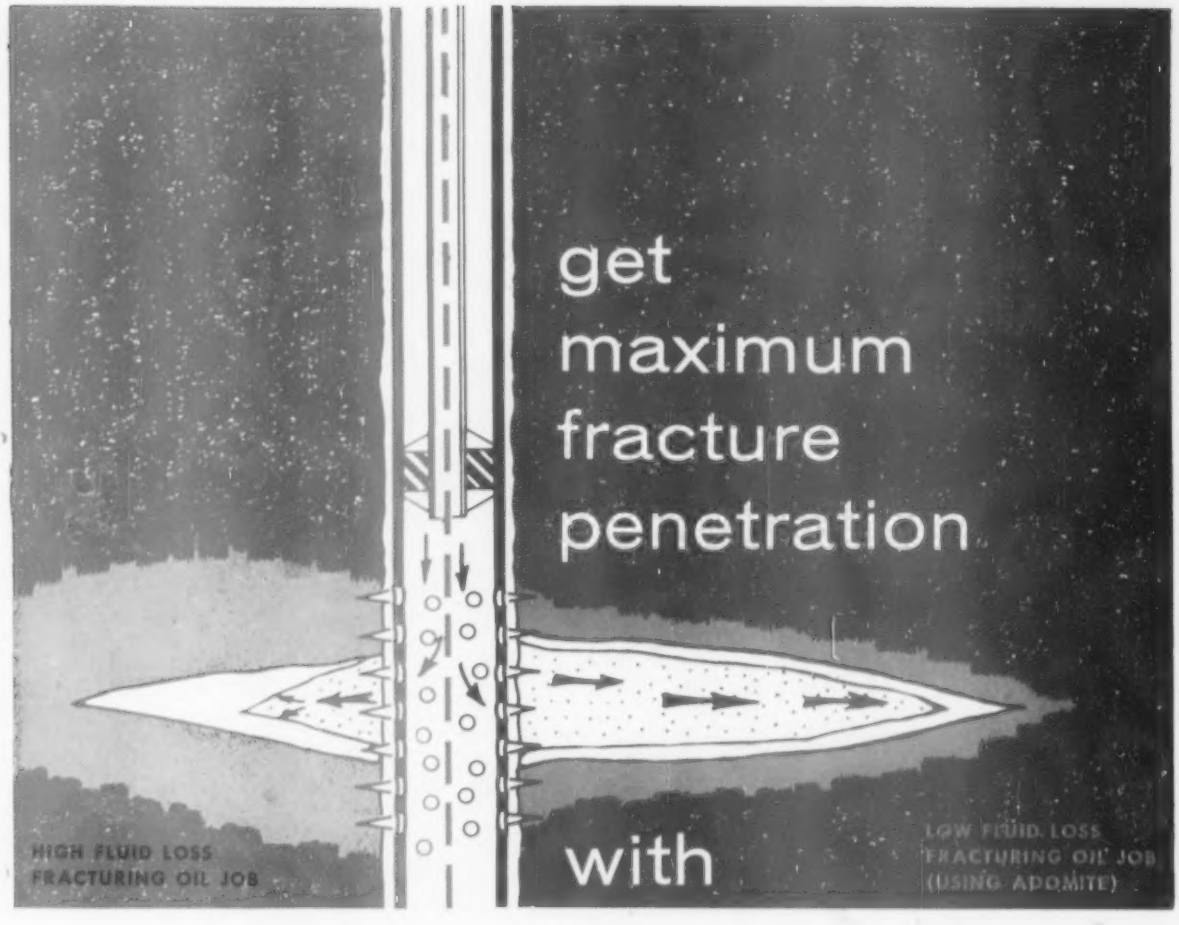
Send for illustrated 30-page catalog, L-550, describing Limitorque automatic valve controllers and components.

LimiTorque®

PHILADELPHIA GEAR WORKS, INC.
ERIE AVE. & G STREET, PHILADELPHIA 34, PENNA.
Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS

Limitorque Corporation • Philadelphia



Adomite®

CUTS FLUID LOSS TO LESS THAN 10 CC.'S

Here are some very sound reasons why producers everywhere are fracturing with Adomite, the fluid-loss control agent proven profitable in 10,000 field treatments.

INSTRUCT YOUR SERVICE COMPANY TO USE ADOMITE

Adomite—developed and manufactured by Continental Oil Company

Adomite ® trade-mark, Continental Oil Company
© 1956, Continental Oil Company

Seals the fracture face . . . minimizes fluid loss . . . no damage to formation.

Longer fractures . . . deeper penetration of sands.

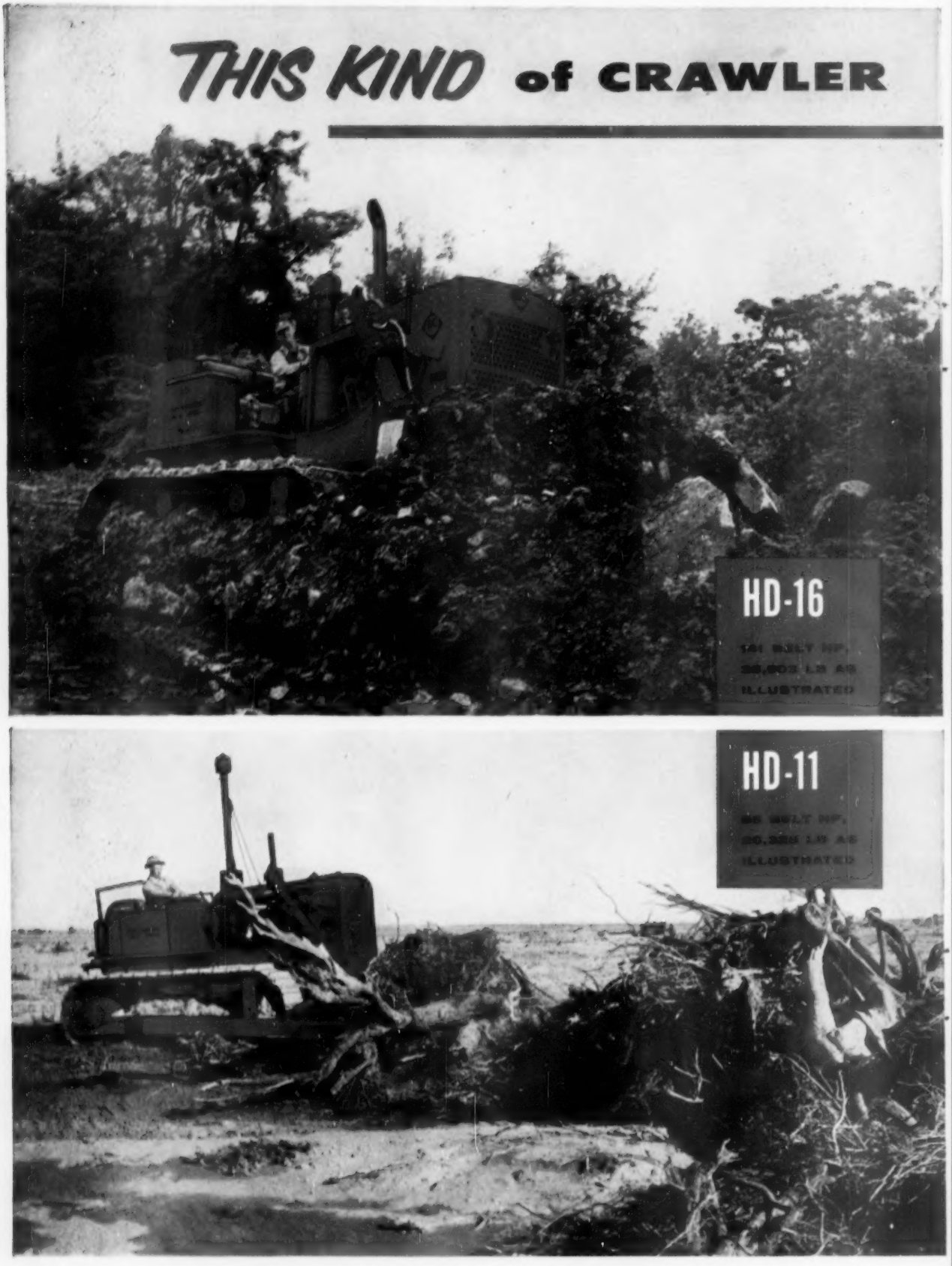
Fewer sandouts . . . reduces fluid loss in rock matrix, prevents buildup of sand concentrations in the fracture.

Saves you money . . . utilizes your own lease crudes . . . saves transportation costs.

Decreases friction loss . . . low viscosity of Adomite-created fracturing fluids permits use of less pumping equipment than with viscous refinery residuals.

Reduces hazard of emulsions . . . emulsion-breaking characteristics are important consideration to many producers.

Adomite, and **only Adomite** is all you need to control fluid loss of kerosene, crudes, gelled crudes or refinery residuals.


THIS KIND of CRAWLER
HD-16
HD-11

TRACTOR DESIGN gives you

EXTRA oil field output

...and only Allis-Chalmers Crawler Tractors have it...

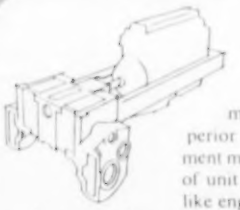
advanced-design features that combine big performance, versatility, dependability and simplified servicing!

Look at the advanced basic design of Allis-Chalmers crawlers—see how they're built to give sure-footed traction, better working balance. But there's more to these crawler tractors than meets the eye—the performance advantages of Allis-Chalmers advanced basic design. It provides more working power, more strength in all components, more working weight where it's needed . . . makes them outstanding performers with drawn or mounted equipment . . . easier to operate and maintain.

Let your Allis-Chalmers dealer show you how Allis-Chalmers crawler tractors can give you that extra output on your oil field jobs.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WIS.

ALLIS-CHALMERS



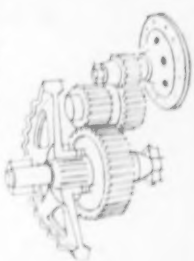
Special Strength and Protection

Exclusive all-steel, box-A main frame makes possible superior over-all balance, better equipment mounting . . . plus service simplicity of unit construction. Major assemblies like engine and clutch can be removed without disturbing adjacent parts. One-piece "wrap-around" radiator guard provides maximum strength for bulldozer mounting . . . complete protection for radiator.

Allis-Chalmers Heavy-Duty Diesel Engine. The power plant is designed for big output, ample reserve capacity and low maintenance. Energy cell controls combustion timing and pressures for high efficiency. Tornado turbulence mixes air and fuel thoroughly for more complete burning. Follow-through combustion sustains effective working pressures to take advantage of better crankshaft leverage.

Extra Clutch Life—with Ceramic Lining. Master clutches offer simple, single-plate, over-center design. Revolutionary new ceramic button clutch lining keeps clutch operating longer between adjustments . . . lengthens clutch life . . . reduces lever pull for easier operation.

Straddle-Mounted Final Drive Gears. Tapered roller bearings support both ends of the final drive gear shafts. Smaller gears and shorter shafts (plus line-bored, one-piece case), provide better bearing and gear alignment, more strength, longer life. Double-reduction final drives provide greater ground clearance.



New Design, Heavy-Duty Track. Long life under the toughest conditions. Side bars have more steel where it's needed . . . benefit from new heat-treating methods which make possible new standards of strength and hardness throughout for extra wearability.

OTHER OUTSTANDING FEATURES

At no extra cost, you get roller bearing truck wheels, idlers and support rollers; 1,000-hour lubrication intervals for truck wheels, idlers and support rollers; 24-volt direct electric starting; crankcase guard; bumper; and lights.

PERFORMANCE VERIFIED / by acid test

Even before a Powell Corrosion Resistant Valve is made, it must pass the acid test. For quality control begins with the very materials which go into Powell Valves.

Constant laboratory control is one of the many ways we make certain that Powell Corrosion Resistant Valves will give dependable flow control. Another is the final step of manufacture: *every Powell Valve is subjected to an actual line test.*

To keep pace with the rapidly expanding chemical and process industries, Powell has designed many new types of Corrosion Resistant Valves. The variety of pure metals and special alloys in which they are available has grown to such an extent that today there is a Powell Corrosion Resistant Valve to control the flow of almost every known, corrosive fluid.

Consult your Powell Valve distributor. If none is near you, we'll be pleased to tell you about our COMPLETE *quality line* which has PERFORMANCE VERIFIED.

The Wm. Powell Company, Cincinnati 22, Ohio . . . 110th YEAR

PERFORMANCE PV VERIFIED

FIG. 1503 SS (Sectional)—150-Pound Alloy Steel Gate Valve.

FIG. 3065 SS (Sectional)—300-Pound Bolted Cap Alloy Steel Horizontal Lift Check Valve.

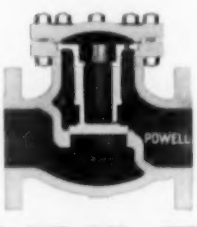


FIG. 1333 A (Sectional)—Integral Bonnet Angle Valve For Pressures of 1500 and 2500 W.S.P.

POWELL VALVES

BRONZE, IRON, STEEL AND CORROSION RESISTANT VALVES.

. . . RED TAPE can be cut at WILSON SUPPLY CO.

The Drilling and Producing Industry moves fast—

decisions are often made quickly . . . time is important.

Wilson Supply Company is large enough to meet

every demand for performance proven products and service—

yet small enough to make rigid policies unnecessary.

Some Red tape may be a part of every business—

but Red tape **can** be cut at Wilson Supply Company.

"WHAT YOU WANT—WHEN YOU WANT IT"

BRANCH STORES

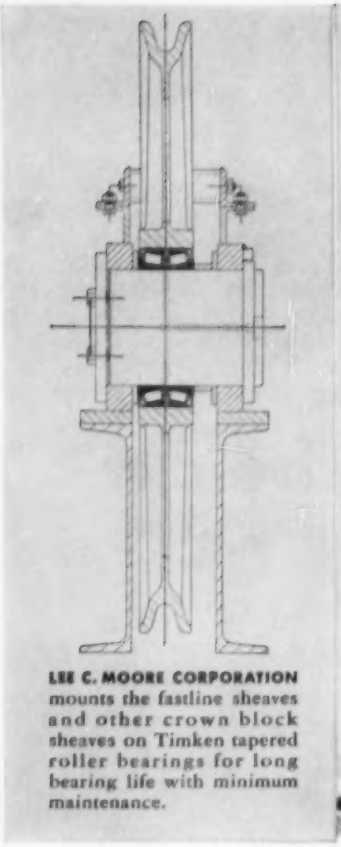
TEXAS: Alice, Corpus Christi, Victoria, McAllen, Bay City, Columbus, Barbers Hill, Liberty, Beaumont, Kilgore, Sherman, Odessa. LOUISIANA: Lake Charles, New Iberia, Houma, Harvey, Shreveport.

SALES OFFICES

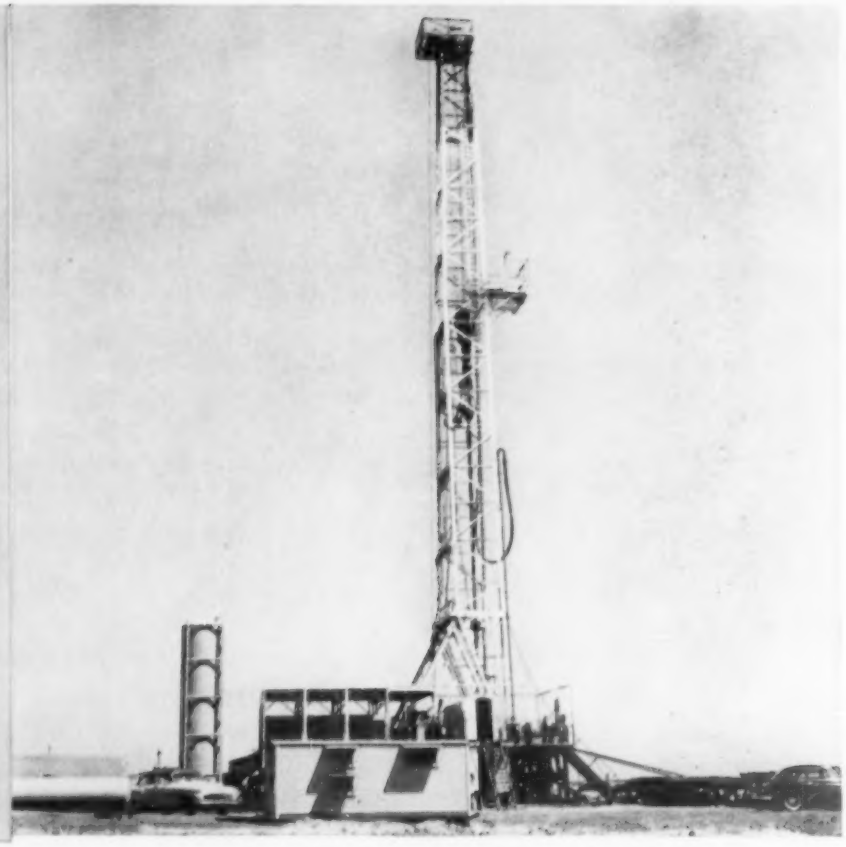
DALLAS — SHREVEPORT — SAN ANTONIO
TULSA — NEW ORLEANS — LAKE CHARLES
CORPUS CHRISTI — MIDLAND

MAIN OFFICE and WAREHOUSE—1301 CONTI ST.

WILSON SUPPLY CO
HOUSTON, TEXAS



LEE C. MOORE CORPORATION mounts the fastline sheaves and other crown block sheaves on Timken tapered roller bearings for long bearing life with minimum maintenance.



New mast crown block makes improved position of "derrick man" possible, reduces fleet angle . . . all sheaves on TIMKEN® bearings

LEE C. MOORE cantilever masts offer a new crown block arrangement which permits the drilling line to enter the block approximately at the well centerline. With the fastline sheave set at an angle, and the flat side of the traveling block to the open side of the mast, improved working position is obtained for the operator on the racking platform, and the fleet angle problem is reduced.

All sheaves are mounted on Timken® tapered roller bearings, for easier rolling. Timken bearings take radial, thrust loads in any combination. It's the tapered construction. All rollers and races are case-carburized—to provide hard, wear-resistant surfaces over tough, shock-resistant cores. And full line contact between rollers and races gives Timken bearings *extra* load-carrying capacity.

Geometrically designed and precision-made to give true rolling motion, Timken bearings meet rigid quality controls from melt shop to finished bearing. We use alloy steel so fine we have to make it ourselves. No other American bearing maker does this. So, when you build or buy equipment for drilling, look for the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

TIMKEN TAPERED ROLLER BEARINGS ROLL THE LOAD

TRADE-MARK REG. U. S. PAT. OFF.

Experts on making hole...fast!

A Baroid Engineered Mud Program is designed to help you make hole fast! Baroid's money-saving mud programs work right every foot of the way. *For the oil industry's most-imitated service,* call Baroid's Area Headquarters or your Baroid Service Engineer.

When you buy Baroid—You buy the best!

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas

7 AREA HEADQUARTERS: HOUSTON • TULSA • LOS ANGELES • DENVER • CALGARY • MIDLAND • NEW ORLEANS

5613

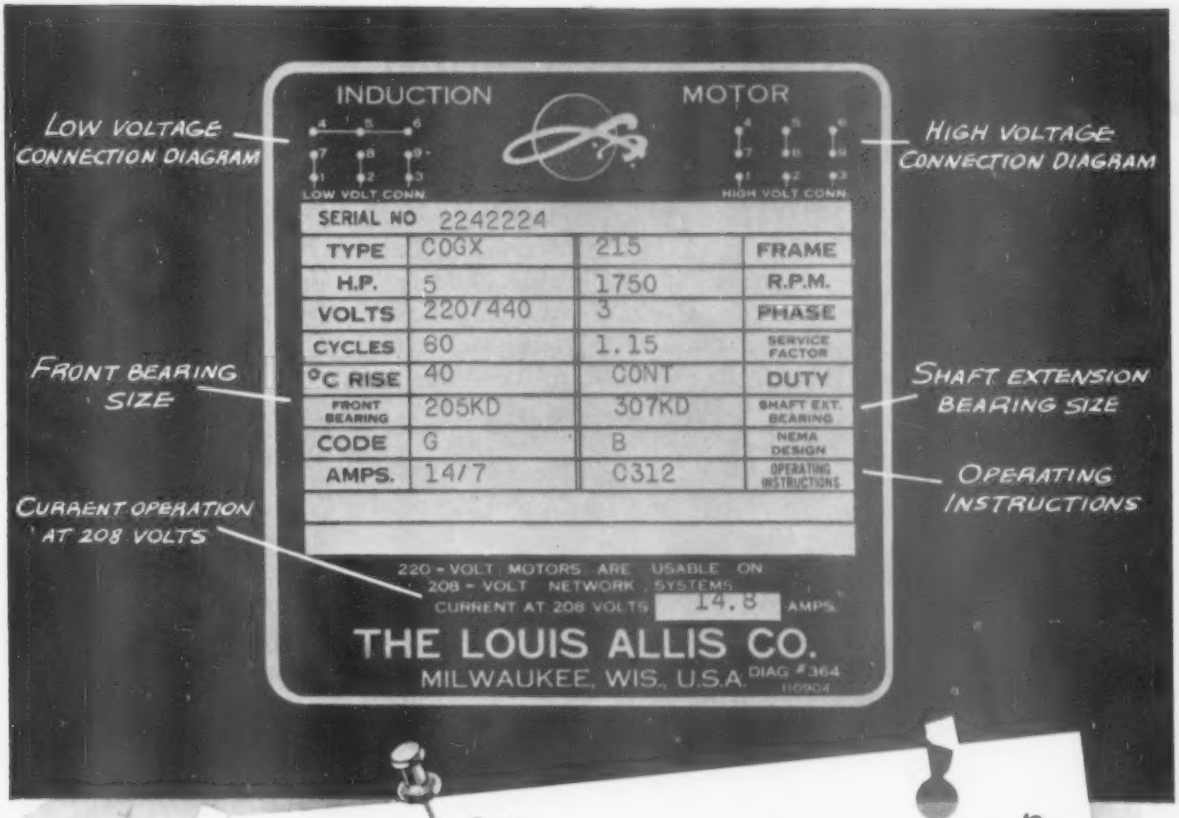
24 HOURS A DAY...

YOUR BAROID DISTRIBUTOR IS IMMEDIATELY AT YOUR SERVICE

BAROID

BAROID

BAROID DIVISION • NATIONAL LEAD CO.
Main Office: P. O. Box 1675, Houston 1, Texas


LOW VOLTAGE CONNECTION DIAGRAM
HIGH VOLTAGE CONNECTION DIAGRAM
FRONT BEARING SIZE
SHAFT EXTENSION BEARING SIZE
CURRENT OPERATION AT 208 VOLTS
OPERATING INSTRUCTIONS
INDUCTION MOTOR
LOW VOLT CONN.
HIGH VOLT CONN.
SERIAL NO 2242224
TYPE C0GX 215 FRAME
H.P. 5 1750 R.P.M.
VOLTS 220/440 3 PHASE
CYCLES 60 1.15 SERVICE FACTOR
°C RISE 40 CONT DUTY
FRONT BEARING 205KD 307KD SHAFT EXT. BEARING
CODE G B NEMA DESIGN
AMPS. 14/7 C312 OPERATING INSTRUCTIONS
220 - VOLT MOTORS ARE USABLE ON 208 - VOLT NETWORK SYSTEMS
CURRENT AT 208 VOLTS 14.8 AMPS
THE LOUIS ALLIS CO.
MILWAUKEE, WIS., U.S.A. DIAG # 364

why is this nameplate important to you?

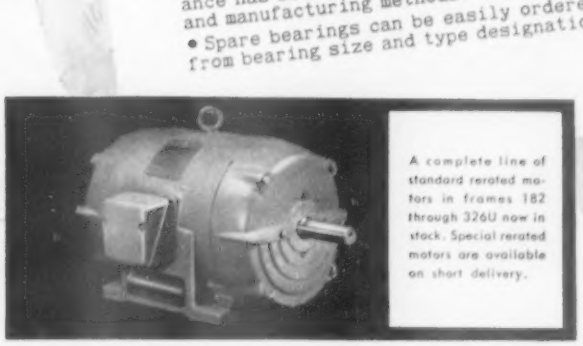
It provides visible evidence that Louis Allis standard motors are built with special care to run better, last longer . . .

Look at the information on this nameplate—information that makes life a lot easier for the user. And to keep this information available at all times, we make this nameplate out of corrosion-resistant stainless steel.

Yes, in the new LA line of standard motors, even the nameplate gets special attention from our engineers. And here's what it means to you:

- The rerated frame size shown means more horsepower from motors with smaller outside dimensions. Performance has been improved by new materials and manufacturing methods.
- Spare bearings can be easily ordered from bearing size and type designations on nameplate, thus eliminating disassembly of motor to determine bearing size. Bearings used are conservatively rated for long life.
- No more lost connection diagram since this information is simply and clearly shown on nameplate. This combined with permanent lead markings, assures that correct motor connections can always be made.
- 220/440 volt motors are suitable for operation on 208 volt systems and full load current for 208 volt operation is included on the nameplate. This eliminates need for original equipment manufacturers to carry a stock of 208 volt motors.

Because they are built with special care, new LA standard motors can do a lot more for you. New bulletin No. 1700 shows you why—just write for your copy.



A complete line of standard rerated motors in frames 182 through 326U now in stock. Special rerated motors are available on short delivery.

LA-106

THE LOUIS ALLIS CO.
MILWAUKEE 7, WISCONSIN

One "Microballoon"* treatment cuts evaporation loss

...a big 80%

Sohio Pipe Line Company has saved an estimated $50,000 worth of crude oil through the use of "Microballoon" spheres. For two full years evaporation has been cut 80 per cent! Yet the complete application paid for itself in a matter of months!

This gathering station of the Tri-State Area located at Mt. Vernon, Ind., includes working and multi-purpose tanks containing Kentucky crude and Illinois crude having a 4 to 6 RVP rating.

"Microballoon" spheres are non-abrading and won't harm tanks, pipes or pumping equipment. For more information, write Bakelite Company, or *Chicago Bridge & Iron Company*, Chicago 4, Illinois.

*Registered trade-mark of The Standard Oil Co. (Ohio)

INSIDE STORY! "Microballoon" spheres float ⅜" deep on surface, forming a perfect vapor-sealing layer for over two years.

BAKELITE COMPANY, *A Division of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

The term BAKELITE and the Trefoil Symbol are registered trade-marks of UCC

MEN

make service!

LUE "CEMENTWALL" JACKSON

...a "Cementing General" who wins for you at the well!

What "Stonewall" knew about military strategy, Lue "Cementwall" Jackson knows about oil well cementing tactics. For successful cementing is like successful campaigning. You've got to evaluate the situation ...plan the logistics... move in the men and equipment... and accomplish your objective.

"Swivel chair" generals don't win oil well victories. And you can't substitute for "savvy" at the well site. BJ Service is strong in field generals who have the experience and know the terrain. Good men, backed by the best equipment, get your job done on schedule and as planned.

BJ Service is proud of men like Lue Jackson... veteran campaigners of the oil patch. Their successes speak louder than our printed words. On your next cementing job, call on the company who gets there first with the most... BJ Service, Inc.!

BJ Service

BJ SERVICE, INC.

A SUBSIDIARY OF BORG-WARNER CORPORATION

GENERAL OFFICES:

6505 Paramount Boulevard Long Beach 5, California

Los Angeles Phone: NEvada 6-0201 • Long Beach Phone: GArfield 3-1411

Service stations throughout the Pacific Coast, Rocky Mountain and Permian Basin areas

OVER THE ROAD

OVER THE HOLE

Torqmatic Handles Two Tasks in Franks Clipper Rigs

(in slim hole drilling, it's Torqmatic all the way)

One transmission for two jobs—that's the story of Allison TORQMATIC DRIVES in Franks Clipper rigs. These Clippers handle slim hole drilling, servicing and workover jobs with a speed that'll make you whistle—and a low cost that'll make you grin.

Over the road, the Allison TORQMATIC DRIVE transmits engine power to the driving axles of this completely self-contained rig. It drives as easy as any highway truck—far easier than most—because there's no clutch pedal to push, no gearshift guesswork. The speedy Clipper's clip on the highway and off means more time for the job—less time *between jobs;* means operators get more use out of their rigs and a greater return on their investment.

Over the hole, the Allison TORQMATIC DRIVE speeds operations and cuts costs, too. Drillers make faster round trips because they can bring a string off bottom in low gear, then quick-shift to high at full throttle for quicker pipe pulling. And the TORQMATIC Converter extends equipment life because it cushions shock loads instead of transmitting them to the drive-line and other rig components.

The number of oil men who swear by Allison TORQMATIC DRIVES is legion. They've seen the low-cost performance records rung up through the years by these torque converter-transmission teams. If you'd build or buy better equipment, specify Allison TORQMATIC DRIVES. More information? Write Allison Division of General Motors, Box 894R, Indianapolis 6, Indiana.

GM TORQMATIC *Allison* ★ TORQMATIC DRIVES

GM MORE POWER FOR YOU

STEEL PIPE *at work*

API LINE PIPE IN ACCORDANCE WITH AMERICAN PETROLEUM INSTITUTE SPECIFICATIONS

- pipe with the yearmark!

WHEATLAND TUBE COMPANY

Bankers Securities Building, Philadelphia 7, Pa. | Mills · Wheatland, Pa. · Delair, N.J.

TECHNIQUES *and* TOOLS

MAKE THE DIFFERENCE IN WESTERN HEAT EXCHANGERS

The manufacture of Western heat transfer equipment is characterized by two important factors: (1) employing the latest and best data available in establishing the actual needs of our customers quickly and accurately; (2) employing the same care and attention to detail in the fabrication of the equipment required.
Western Supply Company renders a *complete service* to each customer — research, design, engineering and fabrication — resulting in equipment of exceptional quality at a fair price, and built for long-life economy.
Your heat transfer requirements — present or future — deserve the attention of Western *specialists* in this field. We'll appreciate your inquiry.

In the *thermal rating* of heat transfer requirements, Western engineers have developed a technique which is actually a *consulting service*, working closely with customers to arrive at the best and simplest solution of their needs.

Thus, each Western exchanger is sized to give the most economical unit for the job, and reflects the experience gained in working equally closely with other customers with similar problems.

The Western "technique" also recognizes the importance of completing your heat exchanger file quickly, thereby allowing you to proceed with other operations.

For instance, when standard floating head, U-tube or fixed tube sheet exchangers are ordered from Western, you can depend on receiving drawings *within 7 to 10 days,* enabling you to proceed with piping and foundation drawings immediately.

In the fabricating stage, Western uses only the most modern production tools and equipment, assuring the utmost in production control in the building of your heat exchangers. Such quality controls as controlled torque tube rolling, weld x-ray, Magnafluxing and hydrostatic testing assure the consistent high standard of Western exchangers.

ASME code standards represent the *minimum* requirement for Western heat exchangers, but on *each* unit, Western builds the *best heat exchanger possible.*

Thus, in the instance of careful tube hole preparation and controlled torque tube rolling, a given Western Exchanger can be retubed more often for greater savings for our customers, because of these high standards of production.

Techniques and tools *do* make a difference in thermal and mechanical design — and the difference is in your favor at Western!

WESTERN
HEAT EXCHANGERS

WESTERN SUPPLY COMPANY
P. O. BOX 1888 • TULSA, OKLAHOMA

HUDSON-RUSH COMPANY — 753 Gladstone Blvd., Shreveport, La.
130 Casa Linda Plaza, Dallas, 18, Tex.
P. O. Box 3151, Amarillo, Tex.

PROCESS INSTRUMENTS & EQUIPMENT CO. — North Bldg., Charleston, W. Va.

H. W. SEVERANCE — 2416 Frankfort Ave., Louisville, Ky.

They Say—

Panguitch Correction

Gentlemen:

A slight correction to your otherwise fine article "Arizona's Strip Country May Tell a Story," (July 23, page 137). Your "D" on map, T 36 S, R 4 W, Garfield County, is not Panguitch dome, but Bryce Canyon anticline. I know . . . with Charles S. Lavington I found and mapped the structure. The well now drilling is on my government lease, and U.S.G.S designates the unit as the Bryce Canyon Unit. Panguitch is 20 miles away with several structures between it and Bryce.

Harry Oborne
Colorado Springs, Colo.

(Editor's note: The use of the word "Panguitch" was indeed unfortunate and it arose from a kind of deadline desperation. We were unable to find the official name of the structure and used the geographic description as a fill-in).

Alberta Red Earth Discovery

Dear Sir:

In the July 30 issue you mention the important discovery of the Red Earth area of north central Alberta. You might be interested in the background of this play, and, undoubtedly, you will be surprised at the simplicity of the original thinking which led to the success of Union Oil Co. here. Union entered Alberta rather late, not arriving on the scene until 1949—3 years after the discovery of Leduc.

Earl Noble, who became Union's manager in Alberta, did the next best thing possible. He took considerable blocks of acreage in the Peace River area where the territory was still open. Earl left Union to go with the Chase National Bank, and I inherited his job.

I must give 100 per cent credit for Red Earth to Russell Barnes, chief geologist of the Canadian division, with proper credit due to the men who worked under him.

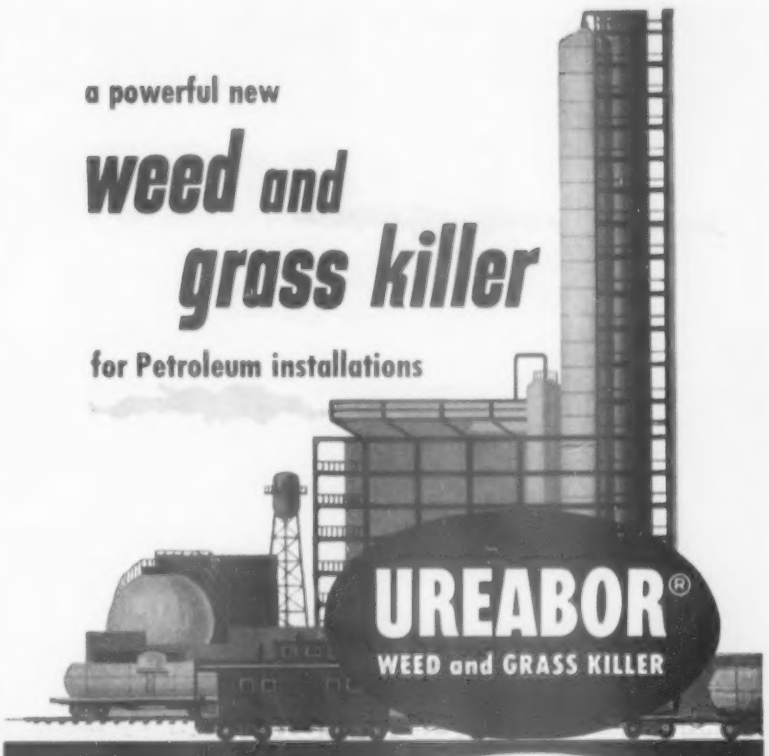
However, the crystallization of the idea to explore for granite wash came about through a visit I made to Alberta approximately a year before the discovery. Two granite wash fields, neither one of much consequence, had already been discovered at that time in a deeper portion of the basin, and although granite wash seemed to be a good prospecting ground the depth was discouraging.

I brought up for discussion at a

a powerful new

weed and grass killer

for Petroleum installations



you get full season's control from one application!

PCB Spreader Makes Applying New Ureabor AS EASY AS WALKING!

A sturdy sling-strap unit made especially for fast, easy, accurate spreading of UREABOR at low rates. Holds enough UREABOR to treat 2500 sq. ft. at 1-pound rate. Simple action. Available at $10.75 delivered anywhere in the U.S.A.

UREABOR offers you release from your weed problems—with new ease and big economy. Never before, a weed killer like this! Apply it DRY—at thrifty, low rates. No mixing—no water hauling—just apply UREABOR direct from sack to weeds. Nothing could be simpler, or safer, to use anywhere. UREABOR is nonflammable, noncorrosive, nonpoisonous when used as directed . . . and effective!

AGRICULTURAL SALES DIVISION
PACIFIC COAST BORAX COMPANY
DIVISION OF UNITED STATES BORAX & CHEMICAL CORPORATION
630 SHATTO PLACE, LOS ANGELES 5, CALIFORNIA

FIRST HELICOPTER FOR OFFSHORE

Sikorsky's new, large S-58 can carry 12 men 150 miles offshore and return without refueling. Amphibious flotation gear, as shown in this artist's concept, *above*, will be standard in offshore service. Cruising at 100 mph, the new S-58 has a high speed of 125 mph. Sikorsky transport helicopters are working every day throughout the free world . . . serving in military and other types of public service, in business and industry, and in scheduled airlines.

S-58 PERFORMANCE FOR OFFSHORE SERVICE

OPERATING RADIUS	150 miles*
CAPACITY	12 passengers or cargo payload of 2600 lbs.*
CRUISING SPEED	100 mph
MAXIMUM SPEED	125 mph

*based on 300-mile range plus ample fuel reserve

TO OFFER ALL THIS PRODUCTION

A new, large helicopter—the Sikorsky S-58—is now being ordered by leading oil companies. Because the S-58 carries more passengers, has greater range and is faster than any helicopter previously available, it opens the way to profitable new offshore opportunities.

Passenger capacity of the Sikorsky S-58 in regular service is twelve men with baggage. The new, big helicopter can haul this load 150 miles offshore. This more than doubles the passenger carrying capacity of the Sikorsky S-55, the largest helicopter currently active in Gulf of Mexico oil operations.

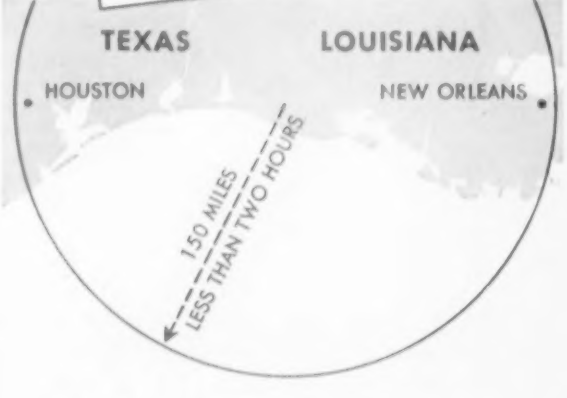
The S-58 offers improved performance and new ease of handling. The R-1820 engine develops 1525 horsepower at takeoff, 1275 horsepower in normal flight. Simplified access to components speeds maintenance. Structural provision is made for a cargo sling and power hoist.

The new Sikorsky S-58 and its companion S-55, world's most widely-used transport helicopter, are based on more than 15 years of engineering, manufacturing and operational experience. For more information, telephone or write B. L. Whelan, general manager, Sikorsky Aircraft, Bridgeport, Connecticut.

GREATER VERSATILITY

A rugged and versatile performer in many over water tasks, the U.S. Navy version of the Sikorsky S-58 above lowers sonar gear into the ocean to hunt submarines. This model helicopter is the first approved by the Navy for flight entirely on instruments. The oil industry can benefit from Sikorsky Aircraft's and the Navy's broad experience with this sea-going helicopter. Already, in the Gulf of Mexico area helicopters are carrying about 20,000 workers and specialists per month. Now the larger, faster S-58 can accomplish even more.

GREATER RANGE

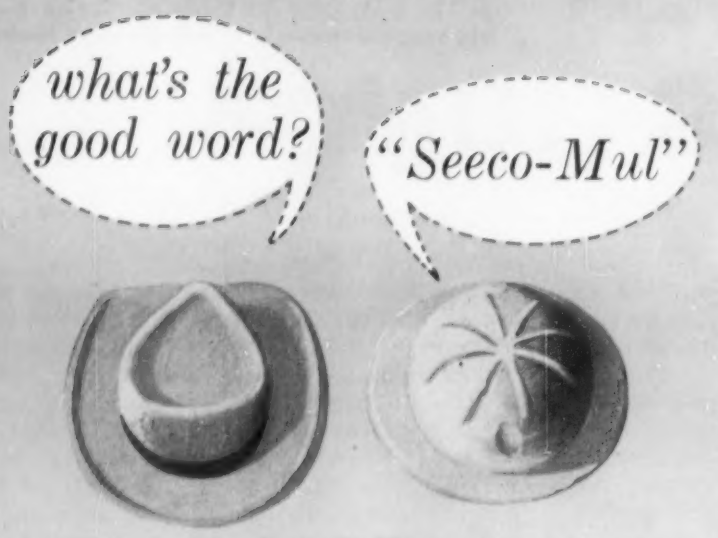


The newly-available S-58 can speed operations farther offshore with its 150-mile operating radius. This extended range permits daily operations serving even the rigs farthest from shore, or wherever surface transportation is inadequate.

SIKORSKY AIRCRAFT

BRIDGEPORT, CONNECTICUT

One of the Divisions of United Aircraft Corporation



Seeco-Mul Emulsifier makes a good mud better

In almost all areas, emulsion muds increase drilling rates, make better hole conditions, drill into pay formations better, afford better coring, and protect the pay zone from water more effectively. Such factors are easily projected into substantial cost and time savings, and mean longer service life for liners, collars, tool joints, bits, and drill pipe.

Seeco-Mul, added to the system 3-5 lbs./bbl., effectively disperses the oil content in an emulsion mud. It maintains a low filtration rate, has good wall building characteristics, contains excellent properties for maintaining the minimum viscosities in a system, makes better hole conditions, and better completions.

The table below shows actual savings that were effected by using Seeco-Mul. Each example compares a lime base oil emulsion mud and a Seeco-Mul oil emulsion mud in geological comparable formations. If you are interested in savings like these, ask your local mud dealer about Seeco-Mul. Your regular mud engineer can use it without special instructions or extra equipment.

MUD	TOTAL DEPTH	TIME ON BOTTOM	AVG. FT./HRS.	BITS USED	AVG. FT./BIT
Seeco-Mul	**9,011**	**191**	**47.2**	**16**	**563.2**
Lime Emulsion	9,150	399	22.9	24	381.3
Seeco-Mul	**8,750**	**225**	**38.9**	**17**	**514.7**
Lime Emulsion	8,700	334	26.0	18	483.3
Seeco-Mul	**8,286**	**207**	**40.0**	**17**	**487.4**
Lime Emulsion	8,650	373	23.2	20	432.5

order Seeco-Mul through your local mud dealer

CROSSETT CHEMICAL CO. • Crossett, Ark.

meeting with E. C. Babson, manager of Union's operations, and Russell Barnes the merit of prospecting for granite wash if we could lay our hands on an area where the depth would not be in excess of 5,000 ft. Knowing granite wash to be up north of Lesser Slave Lake, we moved and filed on 700,000 acres in which the discovery falls were about in the center.

The entire project was approached with the idea that we would eliminate as much as possible all preliminary seismic work and that we would drill a series of wells down dip after an additional test. This to follow wash arisements which might develop.

The first test in the area was a combination Mississippian and granite wash test and resulted in the Red Earth discovery.

Although the above seems very simple, I wish that preliminary ground work had been laid by good prospective thinking so that a choice would have been made of an area which would not run into too much expense.

R. G. Greene
Great Basins Petroleum Co.
Los Angeles, Calif.

Union Pacific Flood Project

Gentlemen:

In the July 23, 1956, issue of The Oil and Gas Journal on page 70 there is an article entitled "Big Flood in Wilmington."

In the latter part of that article it states that "the Block 3 project (previously referred to as Union Pacific Railroad's trial flood in Block 3), a cooperative effort of U. P. and General Petroleum Corp., reportedly is giving good results . . ."

This pilot flood project is being conducted entirely by Union Pacific.

Lee S. Osborne
Assistant Vice President
Union Pacific Railroad Co.

O.C.A.W. Fights Conservation Act

"It (California's proposed Proposition No. 4) has nothing at all to do with conservation. What it would do is cut down on production and jobs in the California oil industry and open up the state to a flood of low-wage foreign oil from Middle East concessions of the big major companies which are backing this measure."

Charles Robinson, secretary of the Oil, Chemical and Atomic Workers District 1, in a statement against California's proposed conservation law.

U.O.P. and the Independent Refiner

"Universal Oil Products Co. is vital to the independent refining industry. Without access to the technology and technological services which it makes

available, on a basis at least as favorable as has prevailed in the recent past, it is doubtful whether the independent refiner can long exist. Any relaxation in the terms of the present trust . . . will in its consequences be adverse to that general welfare.

"The Independent Refiners Association of America has sought to be heard by formal filings in the action initiated by the Guaranty Trust Co. of New York to dispose of the assets of the trust. An increasing number of reports indicate very real concern on the part of refiners across the nation as to whether, if the sale goes through, they will long be able to remain in business.

"Independent refiners are the backbone of the competition which has prevailed in this highly dynamic industry. The real parties in interest are the consuming public and the armed forces of the United States. If we independents lose access to the technological developments which are proceeding at an ever-increasing pace, we cannot survive. By the same token, the benefits of aggressive competition will in the case of oil, at least, be no longer available to the users of petroleum products.

"We are sparing no efforts to place this matter in its proper perspective. Far more than merely a financial transaction or a profit taking maneuver by a trustee is at stake in this proceeding.

"I hope that the New York attorney general's concern for the preservation of a competitive economy will incline him most vigorously to support our request to intervene and to take such steps as are necessary in order to assure that this case is not decided without our participation."

M. H. Robineau, president of the Independent Refiners Association of America, in a statement following I.R.A.A. protest of the proposed sale of U.O.P. stock by Guaranty Trust Co.

Churchill on the Suez

"As far back as 1952 Britain's Sir Winston Churchill confessed that the burden of guaranteeing the security of the Suez Canal had become an international rather than British responsibility. At the time, the venerable prime minister suggested that United States, France, and Turkey join England with troops in the Suez zone to demonstrate the solidarity of the Middle East Defense Command.

"It is obvious that Mr. Churchill foresaw troubles ahead and that in his sometimes uncanny wisdom he moved to create the controls so necessary to prevent the Suez from igniting a major international incident.

"It is too late now, of course, to turn back the clock to fit Churchill's nostrum. But it is apparently the better

how to

CUT CORROSION LOSSES

a report by Koppers Company, Inc.

Russell C. Stromquist
Corrosion Consultant

Recently, we were asked to recommend protective coatings in a plant on the West Coast. In analyzing their coating and enamel needs, we did our usual survey of the installation. After the survey, the customer's Chief Engineer remarked, "You fellows certainly go to a lot of trouble just to tell us what coating system we should use."

We do—because we know it is good for our customers and, therefore, good for us. Case history records prove clearly that careful study *before* making recommendations insures a better protective coating job at lower annual cost. In analyzing protective coating needs, our corrosion engineers follow a "pre-coating check list" based on experience on thousands of jobs.

* * *

The first step in the pre-application survey is a study of the environment. Specifically, you should always take into account the corrosive atmosphere: such factors as acid fumes, intense sunlight, salt air, etc. Physical environment—exposure to abrasion or impact—also plays an important part in the selection of an effective coating system.

The extent of temperature variation and expected minimum-maximum temperatures are important considerations, since the coating chosen must (a) resist low-temperature embrittlement, (b) resist high-temperature flow and (c) harden properly at service temperature.

The moisture environment too, is important in selecting protective coatings. Besides necessary water resistance, the coating should stand-up under pronounced wet-dry cycles.

A thorough cost analysis is a vital part of any pre-coating survey. Many factors are involved, varying in importance with the specific application. For example, total coating cost—made up of surface preparation and application costs—must be balanced against the cost of periodic maintenance. In some cases, the coated surfaces will not be accessible and coating-life will be a *direct* measure of the life of the material.

The cost of probable shut-down or loss of production time is perhaps one of the most important evaluations that must be made in intelligent selection of corrosion-preventing coating systems. Often, it outweighs the direct replacement costs of materials to be protected.

* * *

This pre-coating check list, detailing the protection required and under what circumstances, is a key factor in the exceptional performance of Bitumastic® coatings. Such thoroughness sometimes leads us to willingly recommend some material other than one of Koppers eleven basic Bitumastic coatings to solve a customer's problems.

* * *

In the next report, we will discuss why surface preparation is so vital to the life and economy of any protective coating. Meanwhile, we'd like to hear about your corrosion problems. Koppers Company, Inc., 1300 Koppers Bldg., Dept. 104H, Pittsburgh 19, Pa. District Offices: Boston, Chicago, Los Angeles, New York, Pittsburgh and Woodward, Ala.

KOPPERS

BITUMASTIC
REG. U. S. PAT. OFF.
COATINGS AND ENAMELS

for fast, sound welds...right

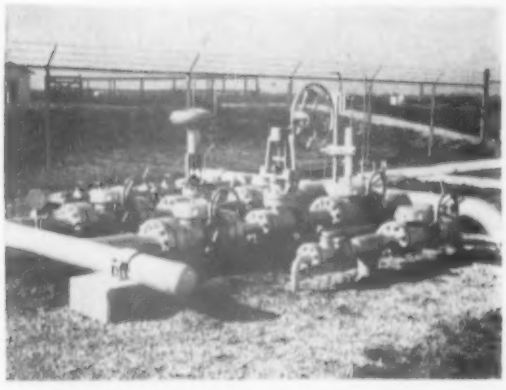
REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

down the line

SPECIFY REPUBLIC ELECTRIC RESISTANCE WELD LINE PIPE



STRONG, SAFE CONNECTIONS are assured by Republic Alloy Steel Studs. Tough full threads provide powerful clamping action without stripping or slipping, yet back off easily for maintenance of equipment. Alloy composition resists corrosion, defies high temperatures or pressures. Order Alloy Steel Studs from your Republic Distributor. Or mail coupon for information.

Quick, accurate field-joint line-up plus fast welding, free of costly delays—these important advantages help you get more miles of sound welds per day, with Republic Electric Resistance Weld Line Pipe. Reason: *uniformity* throughout every joint you receive.

Republic Electric Resistance Weld Line Pipe is formed from flat-rolled steel, uniformly thick from edge to edge and end to end. As a result, pipe is uniformly concentric, uniform in wall thickness—easy to line up, easy to weld. You get smooth, uniform bends because the steel is highly ductile. And its uniform, high-yield strength permits building high-pressure lines. All of these factors combine to facilitate fast, sound welding . . . to help you maintain laying schedules.

Visual inspection of the flat steel before forming results in scale-free surfaces that prevent clogged valves and regulators . . . helps assure years of dependable, trouble-free service in the completed line.

Whatever your oil or gas line-pipe requirements for transmission, gathering, or distribution, look to Republic for top quality line pipe products. Types available include Electric Resistance Weld in sizes 2⅜″ through 16″ O.D., Electric Fusion Weld from 24″ through 30″ O.D., and Continuous Butt Weld from ¼″ through 4″ nominal.

For complete information, contact your local Republic office—or mail the coupon, today.

INSTANT, ACCURATE COMMUNICATION throughout your entire pipeline operating area is easy when you install a micro-wave radio system. Vital link is your broadcasting tower, like the 175-foot self-supporting Truscon Micro-Wave Tower shown here. Truscon Towers are world famous for reliability under all weather conditions. Available in all types. Send coupon for details.

REPUBLIC STEEL CORPORATION
Dept. C-2206
3112 East 45th Street, Cleveland 27, Ohio

Please send me further information on:

☐ Line Pipe ☐ Alloy Steel Studs ☐ Truscon Towers

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

STEEL

and Steel Products

MUDS THAT ARE VIRTUALLY UNAFFECTED BY ANHYDRITE AND SALT ARE MADE WITH MARATHON'S CALCIUM LIGNOSULFONATE

Marathon's calcium lignosulfonate tends to reduce viscosity and gel strength in drilling fluids.

Tradenamed KEMBREAK*, it's the only lignosulfonate proved by years of successful drilling. KEMBREAK conditions lime treated and oil emulsion muds so effectively that they are virtually unaltered by anhydrite, salt or other contaminants encountered in normal drilling, e.g.: gypsum, lime, limey shale, clays, and cement.

Whenever you prepare lime muds, insure trouble-free breakover and maintenance by using Marathon's calcium lignosulfonate.

KEMBREAK
may be obtained from
MILWHITE MUD SALES CO.
HOUSTON, TEXAS
MAGNET COVE BARIUM CORP.
HOUSTON, TEXAS

*REG. T. M., ACCURACY RIG TOOL CO.
Manufactured by

MARATHON *Corporation*
CHEMICAL SALES DEPARTMENT
ROTHSCHILD • WISCONSIN

part of valor to at least seize upon it belatedly as a means to opening the door to a solution that can guarantee Suez sanctity for all nations."

Editorial in the Tulsa Daily World.

CALENDAR

AUGUST

27-29 Sixteenth Annual Gas Measurement Short Course, West Virginia University, Morgantown, W. Va.

SEPTEMBER

4-11 International Geological Congress, Mexico City.

5-7 Wyoming Geological Association, eleventh annual field conference, Jackson Lake Lodge, Moran, Wyo.

7-8 Association of Desk and Derrick Clubs of North America, annual convention, Roosevelt Hotel, New Orleans.

9-11 Independent Natural Gas Association of America, annual membership meeting, St. Anthony Hotel, San Antonio, Tex.

9-12 American Institute of Chemical Engineers, William Penn Hotel, Pittsburgh.

11-13 Pacific Coast Gas Association, annual meeting, Hotel del Coronado, Coronado, Calif.

12-14 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

16-18 Pennsylvania Petroleum Association, annual meeting, Pocono Manor Inn, Pocono Manor, Pa.

16-18 New Mexico Petroleum Industries Committee, annual convention, Hilton Hotel, Albuquerque.

16-21 American Chemical Society, 130th annual meeting, Atlantic City, N. J.

16-21 American Society for Testing Materials, second Pacific area national meeting, Statler Hotel, Los Angeles.

17-21 Instrument Society of America, eleventh annual international instrument-automation conference and exhibit, New Coliseum, New York.

19-21 Southeastern Gas Association, Hotel Sir Walter, Raleigh, N. C.

20-21 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Hotel Henning, Casper, Wyo.

20-21 Mid-Continent Oil and Gas Association, Louisiana-Arkansas division, annual membership meeting, Roosevelt Hotel, New Orleans.

20-22 Oklahoma City Geological Society, field conference, Guymon, Okla.

24-26 American Society of Mechanical Engineers, petroleum mechanical engineering conference, annual meeting, Statler-Hilton Hotel, Dallas.

26-28 Rocky Mountain Mineral conference, American Institute of Mining, Metallurgical & Petroleum Engineers, Newhouse Hotel, Salt Lake City.

28 Natural Gasoline Association of America, Oklahoma regional meeting, Skirvin Hotel, Oklahoma City.

OCTOBER

1-5 American Institute of Electrical Engineers, fall general meeting, Morrison Hotel, Chicago.

2-3 Texas Mid-Continent Oil and Gas Association, thirty-seventh annual meeting, Rice Hotel, Houston.

7-9 American Association of Oil Well Drilling Contractors, annual meeting, Texas Hotel, Fort Worth.

8-10 American Society of Mechanical En-

gineers, American Society of Lubricating Engineers, lubrication conference, Chalfonte-Haddon Hall, Atlantic City, N. J.

9-10 Southwest Kansas Petroleum Industry and University of Kansas, fourth annual two-day gas measurement institute, Liberal, Kan.

10-12 International Geological Symposium of the Williston Basin, Bismarck, N. D.

11-12 California Natural Gasoline Association, fall meeting, Sheraton Huntington Hotel, Pasadena, Calif.

14-17 American Institute of Mining, Metallurgical & Petroleum Engineers, Petroleum Branch, fall meeting, Biltmore Hotel, Los Angeles.

14-20 OIL PROGRESS WEEK.

15-17 American Gas Association, annual meeting, Atlantic City, N. J.

18-19 Western Petroleum Refiners Association, regional technical-industrial relations meeting, Rufus Garrett Hotel, El Dorado, Ark.

18-21 Permian Basin Oil Show, Odessa, Tex.

22-24 National Lubricating Grease Institute, annual meeting, Edgewater Beach Hotel, Chicago.

22-24 Rocky Mountain Oil and Gas Association, annual convention, Cosmopolitan Hotel, Denver.

23-26 National Association of Corrosion Engineers, south central region, San Antonio.

26 Natural Gasoline Association of America, southern regional meeting, Captain Shreve and Washington-Youree Hotels, Shreveport.

26 American Institute of Chemical Engineers, South Texas Section, eleventh annual technical meeting, Galvez Hotel, Galveston, Tex.

29-30 Illinois Geological Survey, Petroleum Engineering Conference on Waterflooding, University of Illinois, Urbana, Ill.

29-30 Independent Petroleum Association of America, twenty-seventh annual meeting, Statler-Hilton Hotel, Dallas.

29-Nov. 1 Society of Exploration Geophysicists, annual meeting, Roosevelt Hotel, New Orleans.

31-Nov. 2 Gulf Coast Association of Geological Societies, sixth annual convention, Plaza Hotel, San Antonio.

NOVEMBER

1-2 Louisiana Polytechnic Institute, fifth annual instrumentation conference, Ruston, La.

7-8 Instrument Society of America, Philadelphia Section, symposium on process data logging, Stratford Hotel, Philadelphia.

8-9 American Association of Petroleum Geologists, Society of Exploration Geophysicists, and Society of Economic Paleontologists and Mineralogists, Pacific Coast Joint Regional Meeting, Ambassador Hotel, Los Angeles.

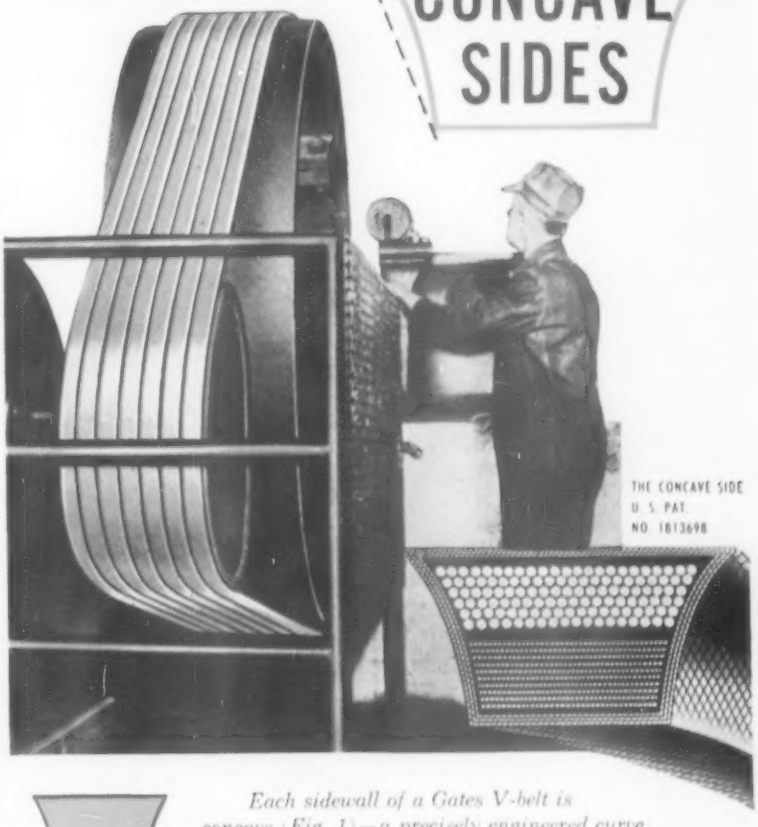
8-9 Society of Automotive Engineers, Inc., national fuel and lubricants meeting, Mayo Hotel, Tulsa.

12-15 American Petroleum Institute, thirty-sixth annual meeting, Conrad Hilton Hotel and Palmer House, Chicago.

19-20 American Institute of Mining, Metallurgical & Petroleum Engineers, North Texas Secondary Recovery Symposium, Municipal Auditorium, Wichita Falls.

25-30 American Society of Mechanical Engineers, Statler Hotel, New York.

Why you get more service from V-Belts with CONCAVE SIDES



Each sidewall of a Gates V-belt is concave (Fig. 1)—a precisely engineered curve that makes V-belts last far longer.

HERE'S WHY: on the bend around the sheave, the concave sides of a Gates V-belt fill out and become straight (Fig. 1-A). Thus the belt makes full contact with the sides of the sheave, grips the sheave *evenly*. This even contact distributes wear uniformly across the sides of the belt.

Uniform wear lengthens belt life; keeps costs down.

MAKE THIS SIMPLE TEST

Bend a straight-sided belt (Fig. 2). The sides bulge at the bend causing uneven contact in the pulley groove (Fig. 2-A). Naturally, wear is greater at points indicated by arrows. Result: shorter belt life, increased belt costs.

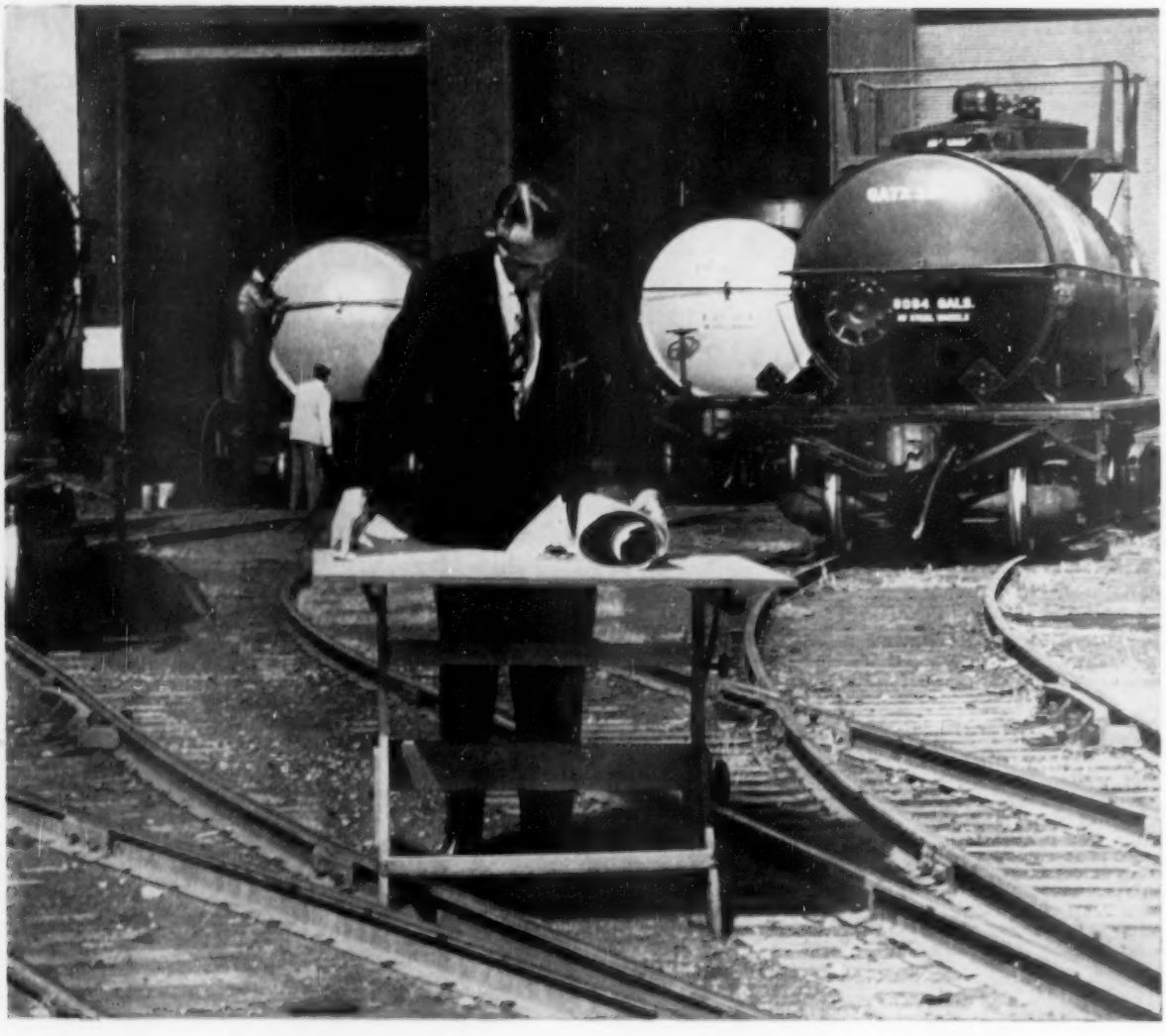
To cut down-time and V-belt replacement costs, specify belts that grip evenly and wear longer. Specify Gates Vulco Rope—the V-belt with concave sides. There is a Gates distributor nearby who will quickly supply the belts you need. The Gates Rubber Co., Denver, Colorado—*World's Largest Maker of V-Belts.*

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA 109

Gates

Gates VULCO ROPE Drives



What does an engineer do for GATX?

Engineering a special-purpose tank car is a job for experts. Stress, mobility, center of gravity, corrosion resistance—these are a few of the factors to be considered. At General American you'll find engineering specialists—men who pioneered with aluminum tank cars. These made possible bulk shipments of hard-to-handle liquids. You'll find men who developed the first flued-dome tank car, the first all-welded underframes, the first half-oval heater coils—and a long list of additional improvements.

This engineering skill and experience that make such developments possible is part of every GATX lease—a lease that provides shippers with the most dependable service available for bulk liquid transportation. When you lease cars from General American, you avoid the need for capital investment as well as operating, servicing and maintenance problems.

If you'd like additional information concerning the advantages of a GATX lease, call or write your nearby General American District Office.

It Pays to Plan With General American

GENERAL SERVICE CARS ALUMINUM CARS PRESSURE CARS INSULATED CARS

GATX GENERAL AMERICAN

GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street • Chicago 90, Illinois
Service Offices In Principal Cities
Service Plants Throughout The Country

The OIL AND GAS JOURNAL

TULSA, OKLAHOMA

Published every Monday by The Petroleum Publishing Co., 211 South Cheyenne Avenue, Tulsa, Okla. Phone Diamond 3-6291. Founded in 1902. Name changed to The Oil and Gas Journal in 1910 by Patrick C. Boyle.

P. C. LAUINGER
President

S. H. ROURKE
Executive Vice President

MITCHELL TUCKER
Vice President and Advertising Manager

HANSON B. PIGMAN
Circulation Manager

DONALD W. WILSON
Manager Industry Census Department

J. PARKER HOLLAND
Production Manager

ADVERTISING OFFICES

TULSA
211 South Cheyenne, Diamond 3-6291
JOHN D. REILLY — Mid-Continent Manager
FREN G. HOLLINGSWORTH — Representative
D. B. MILLER — Classified Adv. Mgr.

NEW YORK
500 Fifth Avenue, LOngacre 4-6160
E. S. KLAPPENBACH — Eastern Manager
JAMES W. BROWNLEE — Representative
HARRY B. BULLEN — Representative

PHILADELPHIA
1509 Land Title Building
Broad and Chestnut Streets, RI 6-0118
JOHN W. MEANY, JR. — District Manager

CHICAGO
105 West Madison Street, CEntral 6-2537
DAVID T. KENNEY — District Manager
KAREL WEGKAMP — District Manager

DETROIT
204 Washington Square Building,
Royal Oak Mich., LIncoln 7-9455
JOHN D. YODER — District Manager

PITTSBURGH
106 Nelson Avenue, FRemont 1-7775
ALFRED M. JONES — Manager

HOUSTON
Sterling Building, CA 4-7726
JOHN M. SPEARS — Gulf Coast Manager

DALLAS
1238 Mercantile Bank Building, STerling 3074
GEORGE O. RUPPERT — District Manager

LOS ANGELES
650 South Grand Avenue, VAndike 0722
DONALD O. HANSON — Manager

ENGLAND
National Provincial Bank Chambers,
15 Grafton Street, Altrincham
Phone Altrincham 3160
HARRY BECKER — European Representative

Subscription rates to the petroleum industry, United States and foreign, 1 year, $4.00; 2 years, $7.00; 3 years, $8.00. Single copies; regular issues 50 cents; special issues $1.00. Back copies when over a year old, $1.00. Note: Payments from outside the U.S.A. may be made by international money order, New York Exchange, or check on a U.S.A. bank. Entered as second-class mail matter at Tulsa, Okla., under Act of March 3, 1879. Copyright 1956 by The Petroleum Publishing Co.

Member
Audit Bureau of Circulations
Associated Business Papers

JOURNALLY SPEAKING . . .

Canadian Sabbath

EVER spend a Sunday in Calgary? You don't know anything about "blue laws" until you do. Everything closed up tight. No movies, no taverns, no entertainment. No stores open except a very few designated drug stores and filling stations for emergencies. Not even a Sunday paper. You go to church, period.

Our Frank Gardner found this out when he was in Calgary gathering the material for the special articles in this issue of the Big Yellow Book. We don't know exactly what he had anticipated doing on his week end there, but whatever it was he didn't do it. He just walked listlessly along the deserted streets and sat quietly in his hotel room.

However, this probably was a good thing, not only for Frank's soul but also for his readers. He could spend the time meditating on the material he had in hand, checking over the figures in his big tables on Canadian production, and doping out good subjects and authors for contributed articles. The results speak for themselves.

It was during this Sabbath meditation that Frank thought up the slogan he sprinkled all through this issue: "Canada—where oil is king." Now for the benefit of our good readers in Canada and other parts of the British Commonwealth of Nations we hasten to explain that in the United States it is simply ordinary American slang to say that anything big is "king." We're sure Frank meant no offense to Her Majesty, the Queen.

Canadian Mystery

AND speaking of special Canadian issues, we have received a clipping from a Toronto newspaper picturing four people intently studying last year's Canadian issue of our favorite oil publication. They were looking for information on how to get rid of surplus production.

That's a common problem in several parts of the world these days, but these people had a very special problem. They didn't want to produce any oil at all.

The article explained that they are all home owners in a residential suburb near Toronto. They are troubled by oil seeping into their water wells. Such things have happened in other places, but in this case it wasn't crude oil but high-quality No. 2 heating oil. They have already skimmed more than 1,000 gal. of it off their drinking water.

This is not only a darned nuisance but a baffling mystery. They laid the blame first on a products pipeline a couple of miles away, and then on a bulk-station installation nearby, but neither one would admit to losing any oil. Still the oil keeps coming. One neighbor wanted to sell out and move to where he could get a good drink of water, but nobody would buy property with an oil well on it.

So these unfortunate folks filled up their furnace tanks with the oil and, come winter, they hope to consume a good portion of it. Then they turned to The Oil and Gas Journal for answers to how to get rid of the rest of it.

We regret to admit that this is one question about Canadian oil which we can't answer. But if you are interested in more orthodox oil operations in Canada you will most certainly find answers to a lot of questions in the special articles in this issue.

Whose Screws?

SOME mighty screwy things happen in this business, but the screwiest of all happened last week. Our good friend Buddy Levi, who operates Northwest Mapping Co. in Bismarck, N. D., sent us his latest map of part of the Williston basin. The map was wrapped around the outside of the paper tube, and inside was something heavy and rattly. It proved to be a big package of screws.

We don't know whether Buddy is getting a screw loose or whether he's subtly insulting us—like carrying coals to Newcastle. Reminds us of the time we bound an ashtray in a copy of the Journal and mailed it clear across the country. Anyway, it was a nice map.

—*Henry D. Ralph.*

How to buy a BRIDGE PLUG

Just be sure it meets these 7 requirements

Product No. 400-N

1 IT MUST BE EASILY RUN AND SET on a wire line, on tubing, or on drill pipe. Baker Bridge Plugs were originally designed for running and setting on tubing or drill pipe, and are still successfully set by this method. However, more than 90% of all Bridge Plugs are now set by the Baker WIRE LINE SETTING METHOD, which has become the Standard of the Industry.

2 IT MUST HAVE CLEARANCE FOR FAST, SAFE RUNNING-IN. Baker Retainer Bridge Plugs are designed to provide adequate annular clearance for running in at maximum speed consistent with safety.

3 IT MUST SET QUICKLY AND HOLD POSITIVELY, possible only with a Bridge Plug having opposed slips, and with a packing element retained by lead sealing rings—an exclusive Baker feature.

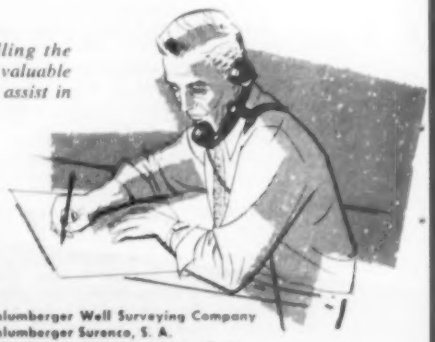
4 IT MUST PROVIDE A LEAK-PROOF SEAL against all differential pressures; and with a Baker Bridge Plug it is not necessary to place cement above it to secure a pack-off.

5 IT MUST WITHSTAND HARMFUL WELL FLUIDS. Baker Bridge Plugs are made of "drillable" Cast Iron for permanent installations, even under severe conditions. The exceptional drillability of Magnesium Alloy Bridge Plugs make them desirable for temporary applications where well conditions are favorable.

6 IT MUST DRILL UP QUICKLY AND EASILY, and Baker Bridge Plugs were designed with "drillability" a primary consideration. The slips are segmented to break up readily, and the shorter bodies are quickly drilled out.

7 IT MUST BE AVAILABLE wherever and whenever you need it. Baker Bridge Plugs are set by all leading wire line service organizations, and are quickly available through their 300 service points.

***Use the BAKER advisory service** by calling the Baker representative in your area. He has valuable field knowledge and helpful suggestions to assist in solving your "bridging" problems.*



For WIRE LINE SETTING
specify . . . Baker Model "N"
Wire Line Bridge Plug
Product No. 400-N

***For wire line setting** contact any of these leading service organizations*

B-J Services, Inc.
Bird Well Surveys, Inc.
The Dia-Log Company
*Dowell Incorporated
Flash Perforating Company
Ford Alexander Corporation
Huskey Guns, Inc.
*Lane-Wells Company
*McCullough Tool Company
*Perforating Guns-Atlas Corporation
Petro-Tech Service Company
Ram-Guns, Inc.
*Schlumberger Well Surveying Company
Schlumberger Surenco, S. A.
Schlumberger of Latin America, S. A.
Schlumberger Overseas, S. A.
Société de Prospection Electrique
Trinidad Oilfield Service Limited
United Oilwell Service, S. A.
Welex Jet Services, Inc.
The Western Company
Worth Well Surveys

*and affiliated companies in Canada

BAKER OIL TOOLS, INC.
HOUSTON • LOS ANGELES • NEW YORK

BAKER RETAINER BRIDGE PLUG

How to do business in Canada

AT A TIME when American oil investments in some parts of the world are precarious, there is a generally comfortable feeling that Canadian oil will always be available to the United States and that American companies can always operate freely in that country.

This ignores recent rumblings and grumblings north of the border. Some Canadians have felt that too much American capital is being invested there, that Americans are dominating their economic development, and that Canadians are becoming "hewers of wood, drawers of water, and diggers of holes" for other people.

This feeling is not to be compared with the rabid nationalism in some other parts of the world. Nevertheless, it should be recognized and reckoned with.

ANALYSIS OF THIS FEELING—including studies made by thoughtful Canadians themselves—shows that its basis is more emotional than factual, at least so far as oil and gas development is concerned. Still, it showed itself in financing the Trans-Canada gas line, to cite one example.

In the oil-producing provinces, United States capital is welcomed and there is only minor resentment against the influx of American oil men and their operating methods. Such resentment as does exist seems to be based on the same factors as is the widespread suspicion of oil companies in this country, that is, lack of understanding of how the oil industry functions.

So the problem of protecting American investments in Canada is the same old problem of public relations. On this score oil has done better than some other industries.

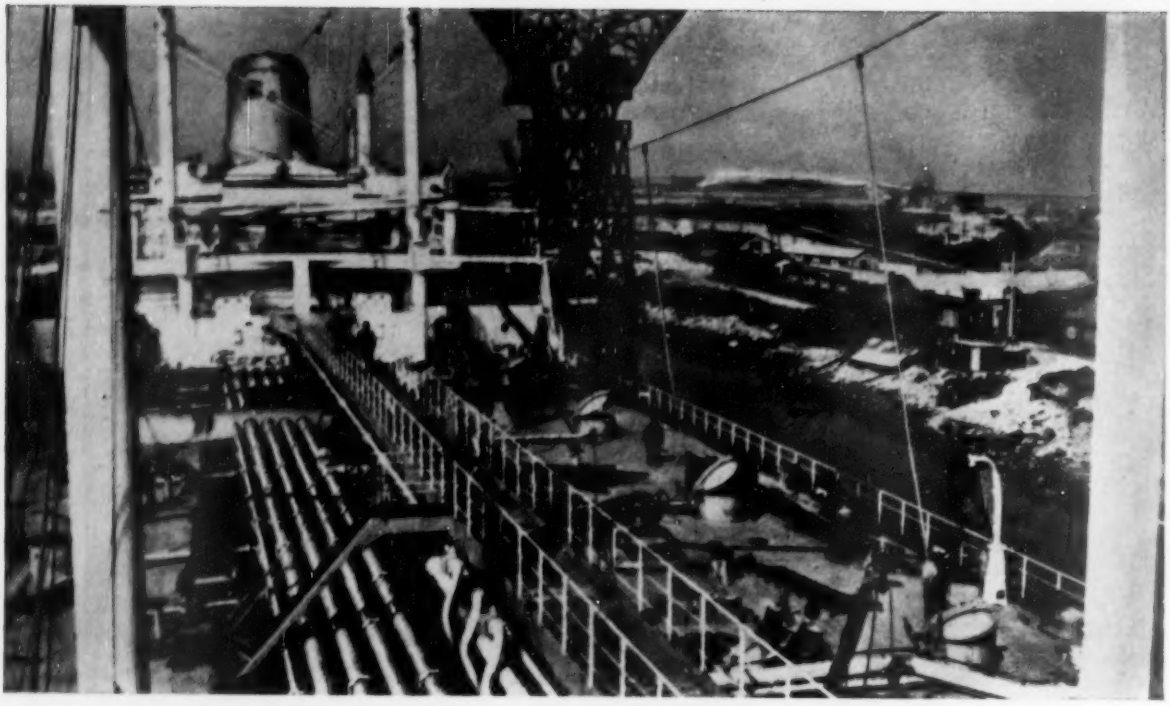
But in Canada the problem is doubly difficult. For all their similarities to Canadians, Americans are aliens—much more so than are Texans, for example, in North Dakota or Utah. This calls for an extra effort to defer to local sensibilities.

And, as in any new oil area, operators are prone to forget that oil is a big mystery to the public. Each company should take special pains to explain how it works—how oil and gas find markets, what determines their price, and so on.

AMERICAN OIL MEN are welcome guests in Canada, but they should always remember that they are guests in another's house, even though they may be "cousins" or "in-laws".

Canadians want an opportunity to share more widely in their oil and gas industry, both financially and in management. They want to know more about why American oil and gas companies there do what they do.

Just a little more individual attention to public relations in general and to Canadian feelings in particular should prevent the recent grumblings from festering into general antagonism to American oil interests.



French tanker *DeBaif*, one of many vessels now equipped with filling pipe cast by one of the world's largest producers of ductile iron, the Pont-à-Mousson Co. of Nancy, France. The company's U.S.A. correspondent is Pontex Pipe Corp., 116 John Street, New York 38, N. Y.

30 tankers now use Ductile Iron pipe... resist corrosion, cut weight, add safety

Relatively new in this country, petroleum pipe of ductile cast iron provides a combination of properties distinctly superior to conventional materials for tanker lines . . .

For ductile cast iron pipe combines the corrosion resistance of gray iron, plus a design strength comparable to that of carbon steel pipe.

Overseas, the Pont-à-Mousson Company of France casts ductile iron loading, stripping and reheater pipe for oil tankers. For superior corrosion resistance in petroleum media Pont-à-Mousson uses ductile iron alloyed with approximately 1.50% nickel. Performance on some 30 vessels during the past several years confirms the durability and economy of ductile iron, for pipe wherever petroleum products must be transported.

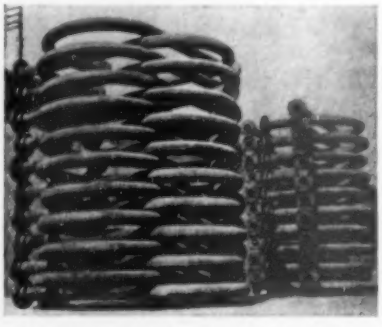
Less corrosion, fewer replacements

In fact, on tankers, this pipe is resistant to corrosion from two different sources. From petroleum cargo, and from sea water ballast on return.

Saves weight, safely

You can cut weight of loading and stripping pipe by specifying ductile cast iron. Its toughness permits walls thinner than those needed in gray iron pipe to withstand mechanical stresses from the ship's motion. You thus substantially reduce deadweight. And you actually increase safety, due to the flexibility and high bursting strength of ductile iron pipe.

Tankers using ductile cast iron pipe now enjoy advantages that are readily available to you. So use this economical material for *your* piping. We'll send you a list of authorized foundries now producing ductile cast iron in the United States. And a Pont-à-Mousson Company booklet describing several applications made by this French organization, with a summary of results. They're yours for the asking... write for them now.



Ductile cast iron heater coils for tanker. Resistance to salt water makes ductile cast iron pipe particularly suited for heater coils. Usually steel coils succumb to corrosion after 2 to 3 years' use. After 3 years, ductile cast iron coils in the same application show no traces of corrosion.

INCO TRADE MARK **THE INTERNATIONAL NICKEL COMPANY, INC.** 67 Wall Street New York 5, N. Y.

Current and significant in . . .

The Industry This Week

Industry

• **Biggest problem if the worst comes at Suez** will be a tanker shortage. Industry leaders already are preparing a tanker pool and studying possible production shifts for U.S., Venezuela, and Canada to serve the West in any emergency. P. 100.

Legal battle over Hydrafrac patent has been settled by Stanolind and Magnolia. The out-of-court agreement establishes validity of Stanolind's patent. P. 102.

Settlement in the offshore dispute between U.S. and Louisiana now appears near. It would avert a shutdown approaching this month for all new drilling in the twilight area. P. 99. Meanwhile Louisiana has cut allowable for offshore wells by 20,000 bbl. in September. P. 102.

Sinclair has made another deal. The company has bought just under one-third of stock of Texas Pacific Coal & Oil. P. 115.

Refining

• **Problem of skimming waste water** to stay within antismog regulations has been solved by Richfield at Los Angeles refinery. It uses two floating-roof preskimming tanks and two air-flotation cells equipped for vapor recovery. P. 107.

California refiners are stepping up their crude-oil imports. They averaged 218,000 bbl. daily in July compared with 65,000 bbl. a year ago. P. 103.

Production

• **Ratable-take experiments are paying off** in Texas gas fields. They point way to a new state-wide proration system later. P. 96.

A serious production crisis may develop in Headlee Devonian field in West Texas. Texas Gulf Producing is asking cutback to 3 producing days a month. It says operators face huge losses unless field is quickly unitized and pressure-maintenance project started. P. 106.

Stepped-up Iranian production is hinted in Iran's latest offering of royalty crude. It is asking for bids on 27,518,000 bbl. of light crude expected to be produced next year. P. 122.

Pipelining

• **Biggest pipeline-building battles** now are being fought in Canada.

Trans-Canada is snaking pipe across the prairie in a race to beat winter into Winnipeg. Officials hotly deny they have given up hope of bringing gas to Winnipeg before next summer. P. 107.

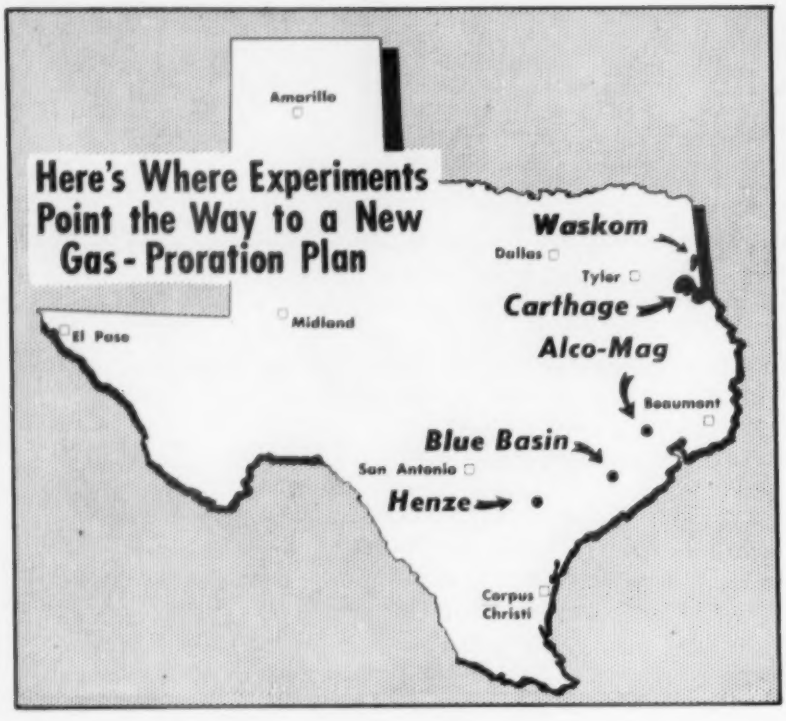
Westcoast Transmission, slowed this spring by rains, swamps, and hills, has made up time fast and now is ahead of schedule. P. 103.

Exploration

• **Cuba's hopes for a big oil producer** have been dampened again. Latest blow: Cuban American Drilling's 1 Catalina has been completed for only 30 bbl. daily. P. 116.

A new wildcat is promised Panama. International Oil & Metals of Seattle plans a test on 10,000,000-acre concession in Darien Province. P. 119.

Stepped-up exploration play for Colombia is in the books. Government is telling oil companies to sign exploration contracts or withdraw applications so others who are waiting can move in. P. 119.



Ratable-Take Ideas Pay Off in Texas Gas Fields

● The long-standing proration system is giving way to new approaches in some problem areas; and early success indicates these trial systems may spread

DALLAS.—Experiments going on in Texas prove that ratable take can be achieved for small gas fields.

But more important, the techniques being learned bring the day nearer in Texas when gas producers may share in a fairer state-wide proration system.

It was only a year ago when the Texas Railroad Commission launched its first experiment in tiny Henze field in DeWitt County. It followed with others in Alco-Mag, Waskom, and Blue Basin fields.

Each of the guinea-pig fields was in trouble. The commission's conventional system for prorating gas output was failing. Producers and pipeliners were yelling for help.

The commission stepped in. Its aim was to give all producers an equal shot at the market. And apparently it has succeeded.

Why the trouble? . . . The conventional proration plan failed because it tended to compound an evil.

The commission normally set the gas allowable for a Texas field by simply adding up producers' forecasts of volumes they expected to sell. Sum of the forecasts thus became the field allowable.

The system worked fine if producers estimated correctly their shares of market demand according to field-allocation formulas. But in some fields they weren't so accurate.

Exaggerated forecasts in such fields created fictitious market demands and led to artificial over and underproduction. This shot the old system of regulation full of holes.

The producer ended up getting to produce far less than he was actually entitled to. The pipeline at first got more gas than it needed, then less than it wanted *(The Oil and Gas Journal, September 5, 1955, page 68).*

The commission found earlier in regulating gas production that purchaser nominations didn't work out well either as a base for fixing allowables.

So it decided to junk producer nominations and try something entirely new.

Two New Systems

The commission came up with two distinctly new methods. It varied them slightly to fit the situation in each experimental field. The methods include setting allowables:

. . . **At end of month,** basing them on actual production.

. . . **Or at first of month** but basing them on market demand derived from many sources.

Humps smoothed out . . . The first plan was used in Henze and Blue Basin fields.

The commission waited until production figures for the month in question were available. The pipeline take from the field, which is actual demand, then was distributed to each well in the field via percentage factors set up by the commission. The factors were based on the field allocation formula, entitling each well to a certain per cent of the total field output.

Over or underproduction for each well was figured along with the allowable for the same period. If a well's output for the month was out of line in either direction, the commission notified the pipeline to adjust its takes accordingly.

The pipeline buyer still was required to file in advance how much gas he needed for the month, but the nomination was used only as a guide to the producer.

The commission made another change in prorating rules for these two fields—one that is regarded as its biggest step yet. It ordered interconnection of pipelines if and when over or underproduction should build up too far. "Too far," it has decided, is anything over three times the monthly allowable.

A pipeline connected to such over produced wells, the commission ordered, would have to take its demand over the allowable from underproduced wells in the field if the overage could not be made up normally. Likewise, any pipeline serving underproduced wells would have to permit the former line to buy from these wells.

The interconnection feature at Henze, it is believed, was inserted in field rules merely to feel out pipeline-industry reaction to it. It had little meaning there since only one pipeline (Wilcox Trend Gathering System, Inc.) takes all the Henze gas.

At Blue Basin, however, the interconnection feature had teeth. There are two pipeline buyers there, and they are two of the biggest — United Gas Pipeline Co. and Tennessee Gas Transmission Co.

Neither has given any hint that it intends to test in court the legality of forced interconnection. The pipelines have carfully avoided getting into a position where they would have to interconnect, however. Representatives have kept in close contact with the commission's gas department to make certain that no Blue Basin well was building up over or underproduction to near the danger point.

Consequently the over and under "humps" have smoothed out. And gas is being produced and taken ratably from each well.

Second method working, too . . . The commission took a different tack in Alco-Mag field of Harris County and Waskom field of Harrison County. This system, so far, appears to be working well too.

The field allowable was fixed in advance. But instead of relying on producer nominations, the commission fixed the allowable at market demand. It determined this by considering producer forecasts, pipeline nominations, production reports, seasonal fluctuations in field output in past months and years, and all other available data.

Allowables in the two fields fixed this way proved much more realistic.

In other new rules, the commission acted to cure another long-time headache—that of unconnected wells in a reservoir.

In the past these wells were allocated an equal share of the field's allowable. When some wells couldn't produce it, the field's production was well below demand. But the next month's allowable was based on the previous month's production. The result was that the allowable, and production tended to drop steadily. As the allowable dropped farther and farther below demand, it was figured, there would be pressure on the pipeline company to connect the nonproducing wells *(The Oil and Gas Journal, January 9, 1956, page 62).*

Now these wells still get their share of the allowable. But the allowable no longer is set on the basis of the previous month's production. It is set according to market demand, but since part of the allowable goes to unconnected wells, the pipelines do not get the full amount they need.

This method is designed to act as a lever on both the unconnected producer and the pipeline, encouraging them to get together. Under the old method, as less gas was produced there was less drainage from unconnected leases. Under the new method, production from connected wells continues at a stable level and the nonproducer is threatened with a greater loss of gas under his lease.

Classic example . . . First trial of the second new regulating method was at Alco-Mag field which boasted a classic example of the unconnected well problem.

All wells in the field were owned by two firms. One was Russell McGuire; the other was Industrial Gas Supply Corp., which also owned the only pipeline outlet for the field.

McGuire's wells were unconnected. He argued that Industrial would not buy his gas except at an unreasonably low price. His wells continued to build up underproduction, while Industrial overproduced to meet its demand until several of its wells were shut in due to the excess.

The commission's equal-pressure policy under the new rules apparently worked. McGuire now has signed to sell his gas to a second pipeline.

A trial at Carthage . . . The new rules in Alco-Mag and in Waskom, a much larger field with four pipelines, appear on the way to evening out over and underproduction and thereby promoting ratable take.

Prospects of success here led the commission quietly to try the same method in the lower Pettet zone of huge Carthage field in Panola County. It had been one of the state's biggest ratable-take sore spots.

The new rules appear to be easing the situation here, too. Along with the rules, a new contract practice has appeared in Carthage to help unravel the over and underproduction snarl there.

A number of Carthage producers have contracts with pipeline buyers which commit the lines to take considerably less than the wells could produce under their allowables. In several recent instances, producers have negotiated second or "surplus" contracts with a second line in need of gas. The second buyer will take the allowable for which the first line has no market. This, of course, has been done with the permission of the pipeline holding the initial contract.

Statewide Prospects

Despite the commission's success in ironing out troubles in the guinea-pig fields with its new proration procedures, it's not likely that either will be applied to all Texas gas fields.

For one thing, the old system is working reasonably well in most fields. Even if it weren't, widespread application of the new system wouldn't be practical.

The Henze-Blue Basin method, where participation factors are devised by the commission for each well, is feasible only in fields where development is complete. The addition of one well in a pool under these rules would force the commission to work up a whole new set of factors. Keeping the factors up-to-date in a field like Carthage where the number of wells fluctuates constantly, would be entirely too burdensome—and on a statewide basis, impossible.

Likewise, a statewide system whereby the commission had to determine accurately each month the market demand of each field (as it does now at Alco-Mag, Waskom, and Carthage's Lower Pettet) would be a tremendous task and too unwieldy.

It's probable that the commission therefore will apply the new regulations only to those fields where the present proration system is badly out of joint.

Equal Take Between Fields

Problem not whipped . . . The commission is making steady progress on the ratable gas-take problem, but it still has a long way to go.

The absence of uniform gas prices is one big roadblock. Prices paid producers by various pipelines, and even by the same line, for identical gas in the same field sometimes differ by as much as 7 to 8 cents an M.c.f.

The price problem is tied closely to another—that of long-term reserve contracts demanded of a pipeline by the Federal Power Commission.

Gas committed years ago at a fixed price in some fields is still sold at that same price—netting the producer far less than gas of equivalent quality will sell for today.

Resulting price discrepancies make it difficult for pipelines to exchange gas as they do oil.

The "surplus" contracts in Carthage are a form of gas exchange, but there are complications even with these. The 20-year contracts required by the FPC dedicate specific reserves to specific markets. It's likely that the FPC would frown on any device which would divert committed gas from one market to another.

The long-term reserve contract demanded of the pipeline by the FPC causes another headache, too, in that it seldom squares with field-allocation formulas approved by the Railroad Commission.

Despite all this, the Texas conservation body seems to be reaching the point where it can effect ratable take

within about any field in the state.

When it reaches that goal, however, the commission will be only half-way home. It still will be confronted with nonratable take between fields. It hopes some day to whip that problem too.

Commission members are looking ahead at situations where the pipeline buyer is connected to several gas fields. The pipeline may have its own production in one of these. Naturally, it will want to take all it can from the field where it is a producer and only fill out its total demand from the other fields.

The same holds true where the pipeline doesn't have its own production in any of the connected fields but where the contract price in one of them is lower.

The commission feels that producers in some fields aren't getting a fair shake because of such situations.

It is mulling over new methods which it may be able to use in the future to plug this loop-hole, too. It has in mind prorating:

. . . **By pipelines.** Under such a system, a single pipeline's total demand would be distributed equitably among all wells in all fields to which the line is connected.

. . . **By areas.** *(The Oil and Gas Journal, February 21, 1955, page 83).* A year and a half ago, the Journal disclosed that the commission was thinking for the future along these lines. One of the commission members has confirmed this publicly at several industry meetings in the past year.

The theory here is based on the fact that the bulk of Texas gas production is bought and transported by long trunk lines. With few exceptions, these originate in four areas—the Gulf Coast, East Texas, the Panhandle, and the Permian basin. The long lines originating in any one of these areas carry gas the same general direction.

Gulf Coast gas goes to the East for the most part. East Texas gas goes northeast to the East or the Chicago area. The great bulk of Permian basin gas goes west to Arizona, New Mexico, and California. Panhandle gas goes north to Midwest markets.

Area allocation would be a bigger, and much more complicated version of allocation by individual lines. The commission admits, however, that adoption of this sort of proration is a long way off.

Gas-price discrepancies and other barriers to wide-scale exchanges of gas between pipeline make tough work of the commission's present efforts for ratable take within a single field.

Area allocation or anything like it, without uniform field prices for gas, would appear completely unworkable.

Refinery Gets First Crude

DELAWARE CITY, Del.—Delaware Gov. J. Caleb Boggs "pulled the plug" on the first shipment of crude to arrive at Tidewater Oil Co.'s 130,000-bbl. Flying A refinery here.

The governor is shown aboard Tidewater's 27,000-ton S.S. Flying A Delaware as he turned the valve to release the supertanker's 200,000-bbl. crude cargo. The ship was docked at the refinery's marine terminal. The plant is the first operation of its kind in Delaware.

With Governor Boggs at the valve-turning ceremony were, from left, George C. Caine, eastern division manager of manufacturing; George F. Getty II, company director and vice president-general manager of the eastern division; Capt. John D. Baldwin, S.S. Flying A skipper; and Richmond K. Kelly, eastern division manager.

Humble Wants to Flood Raccoon Creek

AUSTIN. — Humble Oil & Refining Co. is seeking a permit from the Texas Railroad Commission to form a unit to water flood the Jackson sands under more than 1,000 acres in Raccoon Bend field of Austin County on the Texas Gulf Coast.

The project takes in the entire Graben area of the field. It calls for water injection into both the Gutowsky and Grawunder sands of the Jackson series.

Humble, which owns all leases in the proposed unit, told the commission the area is in the final stage of primary depletion. The field was discovered in February 1928 and has produced 13,000,000 bbl. of oil. Humble estimates the water flood will ultimately double this volume.

The flood plan . . . There now are 21 wells producing from the sands.

Humble plans to use three injection wells in each pay. It will inject about 360 bbl. of water daily per well on a line-drive-type flood plan. Injection water will come from the Vicksburg at 2,800 ft., the Cockfield at 4,100 ft., and the Jackson at 3,200 ft.

Humble told the commission that 97.5 per cent of participating royalty interests have signed the unit agreement. Participation is based 100 per cent on surface acreage.

Opposition to the formula came from one royalty owner, F. C. Roensch. Roensch argued that past production in the area had varied from lease to lease, from 2,306 bbl. per acre in one portion to 34,002 bbl. per acre in another.

Shipley unit approved . . . The commission, meanwhile, approved a unit and water flood for the Queen sand in old Shipley field of Ward County in West Texas.

The project takes in 1,380 acres and 104 wells of the field's total 3,000 acres and 168 wells. It is expected to hike recovery from the area by about 6,000,000 bbl. *(The Oil and Gas Journal, August 13, page 95).*

Offshore Accord Seen

Interior Department, Louisiana board may iron out deal that will permit new drilling in disputed offshore areas

BATON ROUGE.—Federal and state officials were said to be near accord last week on a temporary truce under which the Supreme Court's ban on drilling in the disputed Louisiana tidelands might be lifted.

One report leaking out of a series of closed-door meetings indicated the warring factions had agreed tentatively on a leasing provision. Details of the possible compromise were not disclosed.

A highly guarded letter sent state officials by J. Reuel Armstrong, interior solicitor, is understood to give federal acceptance to all eight changes in the original tentative agreement recommended by the offshore operators seeking to arbitrate the dispute.

If Louisiana officials also are willing to accept the operators' recommendations, an authoritative source said, a final agreement could be reached quickly.

Armstrong reportedly told the state that if it has any changes to suggest it should submit them quickly. A further federal-state conference then could be set up to discuss them.

There were indications that operator pressure would be exerted upon Louisiana officials to act quickly on Armstrong's offer. Acceptance of the industry's suggestions would admittedly be a compromise on several points of difference, and the state will be urged to say how far it will go along that path.

Louisiana meeting . . . In its role as mediator between Louisiana officials and the Interior Department, the committee representing offshore oil operators met with the Louisiana Mineral Board in Baton Rouge late last week.

The industry committee, pressing for immediate resumption of drilling in the disputed area, presented the set of counterproposals from the Interior Department.

In trying to get a compromise offer in writing from the Mineral Board, the industry group was insisting on open hearings for future negotiations. In the past, negotiations have been conducted in secrecy. To keep from upsetting "diplomatic harmony," the bedraggled industry committee has been forced to keep offers and counteroffers under wraps.

One industry spokesman expressed the hope that publication of the opposing stands would show the two governmental agencies are "not too far apart" in their terms. According to his view, the dispute now centers more on matters of pride than on fundamental differences.

Under the Supreme Court's order of June 11, no new wells can be started or leases sold in the disputed area off the Louisiana coast except by mutual agreement between Louisiana and the Interior Department. The area claimed by both Louisiana and the federal Government lies between 3 miles and 3 leagues from shore, but because of conflicting interpretations the disputed zone actually is about 35 miles wide in some sectors.

The Supreme Court, now recessed for the summer, will not settle the boundary dispute until this fall at the earliest.

Leasing takes back seat . . . The Interior Department's earlier insistence on the right to continue leasing in the disputed area was a major stumbling block to a temporary settlement of the controversy. Louisiana officials claimed state law would not permit compromise on this issue.

Report of a tentative agreement on the leasing provision was interpreted as an indication that the Interior Department may have relaxed its stand. As the dispute lingers on, the question over leasing rights dwindles in importance.

Since a 30-day notice is required before the Interior Department can accept bids on leases, an immediate truce would permit no new blocks to be offered until just before Supreme Court reconvenes in October. Unless an agreement is reached soon, the leasing controversy will become a moot question pending final action by the Supreme Court.

Industry spokesmen predict practically all operations will come to a halt within the undefined region covered by the Supreme Court order by the end of August unless a temporary truce is reached.

Montana Plant Planned

TULSA. — The fast-growing Texas Natural Gasoline Corp. is expanding operations with its first plant outside Texas.

The company will build its ninth plant north of Baker, Mont., to serve Pine and Cabin Creek fields in Wibaux and Fallon counties in Montana. It will process around 6,000,000 cu. ft. of natural gas daily, with the residue being sold to Montana-Dakota Utilities Co.

Initial capacity will be 50,000 gal. per day of natural gas liquids. Texas Natural, organized in 1948, will have total liquids capacity of 840,000 gal. per day when the new plant goes on stream. Completion is due in November.

Texas Natural's staff will design, engineer, and construct the plant.

Oil Processes Aid Coal Men

PITTSBURGH. — Two oil refining processes, Hydrofining and Udex, will be adapted to the finishing of coal chemicals for the first time.

Jones & Laughlin Steel Corp. has obtained licenses from Esso Research & Engineering Co. for a 1,310-bbl. per day Hydrofiner. Universal Oil Products Co. has licensed it a 1,350-bbl. Udex unit.

Byproduct light oil from J. & L.'s coal coking plant at Aliquippa, Pa., will first be treated in the Hydrofiner. Hydrogen treating there will convert sulfur compounds to hydrogen sulfide and light hydrocarbon gases. After their removal, the light oil will be separated into high purity benzene, toluene and xylenes. Badger Manufacturing Co. of Cambridge, Mass., had a hand in adapting the processes and is prime contractor. Completion is scheduled for early next year.

Historic Wildcat Fails

GALVESTON.—Operators were preparing last week to abandon an historic offshore wildcat, located farther from shore than any well previously attempted.

Shell Oil Co. and Continental Oil Co., unsuccessful in their first attempt to establish production on a 103,386-acre submerged block, drilled to 13,386 ft. before deciding to abandon the test in Block A-104, High Island area. The location is 63 miles southeast of Galveston.

Operators were preparing to spud a second test on the big federal lease underlying the Gulf of Mexico. "Mr. Gus," giant mobile platform owned by C. G. Glasscock Drilling Co., will be towed 8 miles northwest of the first well to drill in Block A-73 in the same area *(The Oil and Gas Journal, July 30, page 120)*.

Shell paid a bonus of nearly $3,500,000 for the big underwater lease last summer. Later, Continental acquired half interest in the acreage.

Geological details of the wildcat failure had not been disclosed as operators prepared to abandon the test.

Oil Industry Prepares For Worst at Suez

- **Lines of supply and transport being set up to serve West in case Egypt closes canal and Arabs cut pipelines**
- **Production shifts for U. S., Venezuela, Canada planned; shipping big problem; it may mean gas rationing in Europe**

WITH one eye cocked on England, the oil industry last week prepared for the worst in the Suez Canal crisis.

The worst would be loss of the canal and two Middle East pipelines which funnel vital oil into the West.

In London world diplomatic figures gathered to try to put out the fire. They met without the controversial figure present who started all the furor. Col. Gamal Abdel Nasser, Egypt's strong man, declined to attend. It was his seizure of the canal and declaration that it is Egyptian national property that precipitated the crisis.

Chief issue before the conference is whether the canal will be controlled by Egypt or an international board.

Western Europe depends on ships to move 1,500,000 bbl. daily of Middle East crude through the canal. For this reason, these countries feel insecure with the canal under the thumb of a single indvidual, such as Nasser, who could close it on a personal whim. The United States has given its tacit endorsement to their contention the canal must be international.

Meanwhile these were the developments on other fronts:

...An emergency supply committee composed of representatives of 13 American oil companies who operate internationally was appointed by the Office of Defense Mobilization.

...Secretary of State John Foster Dulles briefed members of this committee before he left for the London talks.

...The Arab league in a Cairo meeting served notice on the world that the use of force by the Western powers against Nasser would be regarded as an attack on the entire Arab world.

...Nationalistic threats against all Middle East oil holdings were still being voiced. But these appear to hinge on the outcome of the canal question.

...Suez Canal traffic continues at an almost normal pace. Shippers waited for some overt act to alter the pattern. Most of them still paid tolls to the canal company.

Emergency committee . . . The committee of 13 importing oil companies has received the blessing of the State Department, the Interior Department, under which it will operate, the Federal Trade Commission, and most important of all, the attorney general. The latter waives any possibility of antitrust implications in the committee's actions.

The group first met the week previously in New York with Hugh A. Stewart, the Interior Department's oil and gas division director *(The Oil and Gas Journal, August 13, page 101)*.

There was a definite cloak of security secrecy surrounding the committee's Washington actions last week. But Mobilization Director Arthur Flemming outlined the general aims. Broadly, the committee will try to furnish Western Europe with crude from other areas if the Suez Canal traffic is cut off.

Here are its over-all aims:

...Most efficient use of all tankers, pipelines, terminal, and storage facilities of all the companies without any regard to individual ownership.

...Exchange of crude and products by sale, loan, or some other method to insure that both domestic and foreign oil requirements are met.

...Revisions of foreign production schedules and refinery runs to make the most efficient use of all transportation facilities available.

In short, the committee apparently has been asked to do the same thing a similar group did when Iran nationalized its oil industry, but potentially on a much larger scale.

If Suez Canal traffic is shut down, the group would be largely instrumental in coordinating tanker traffic around the Cape of Good Hope to get as much good as possible out of the available tankers. This invloves the movement of about 1,500,000 bbl. of crude daily.

If smouldering Arab nationalism should flare and cut off the two pipeline systems moving Iraq and Saudi Arabian crude to eastern Mediterranian sea ports, the problem would be multiplied. This would involve another 850,000 to 900,000 bbl. daily of crude, most of it moving to Britain and Western Europe.

Surplus studied . . . The committee obviously will look to surplus United States production to help bridge this gap. Those who estimate how much more oil this country can produce than it is now producing place this figure all the way from 1,000,000 to 2,000,000 bbl. daily. It is probably closer to 1,000,000.

Venezuela, as the world's second largest producing country, would be next on call. It has been estimated in the past week that Venezuela could furnish from 250,000 to 300,000 bbl. daily more oil to the world than it is now producing. Venezuelan officials in this country regard those estimates on "the optimistic side." Venezuela's July production topped 2,500,000 bbl. daily, a record.

Supply adequate . . . Officials are assuming there is enough productive capacity not dependent on the canal or pipelines to meet any crisis.

But whether there is enough tanker capacity to move the oil is another question. The general opinion is that Western Europe and the United Kingdom would have to cut back their consumption—possibly impose rationing.

Uncertainty over the future of Middle East oil movement, however, goes further than the all-important question of supply. It takes in also our own import problem, the supply of tubular goods and other oil steel, and the Military Sea Transport Service's plan for long-term charters of new tankers.

On the import side, the canal crisis is providing domestic producers with a potent argument for strong controls.

The issue will be exploited to the fullest extent in the drive to force the Government to apply the national security clause of the Reciprocal Trade Act.

Seizure of the canal "illustrates the dangers involved in unrestricted oil imports and increasing dependency on such sources for essential strategic materials," it was declared by Russell B. Brown, general counsel of the Independent Petroleum Association of America.

Flemming reported the task force of the cabinet fuels committee is expected to report results of its review of imports early next month. Thereafter, he said, he will call a public hearing on the 19-association petition filed earlier this month *(The Oil and Gas Journal, August 13, page 85)*.

The Suez situation was one of 26 points raised by the associations, who are demanding that February 1955 recommendations of the cabinet committee be strictly applied.

No shortage in U. S. . . . Domestic independent producers reacted unfavorably to one aspect of Government plans in the emergency.

Robert L. Wood, president of I.P. A.A., in a letter to Flemming:

. . . Objected to the "presumption that shortage of oil in the U. S. is expected if the Suez crisis is not properly settled."

. . . Questioned wisdom of entrusting the supply problem solely to representatives of the importing companies who "are to be permitted, working together, to draft plans and programs of action."

A high Government official declared there is no ground for assuming a shortage of oil or products will result from the Suez crisis. Any shortage of supply, he said, would be felt in Western Europe. No action under the plan would curtail supplies in this country.

The big problem in assuring continuity of supply for foreign areas, he commented, is far more likely to be in transportation than in production.

In objecting to heavy influence of international oil companies in the program, Wood observed: "We believe this to be an improper approach to the solution of this problem.

"Outside the violation of the anti-trust laws involved, it contemplates passing on the position of the domestic industry and its abilities to supply our demands by those representing companies whose outside interest in production is greater than in the U. S."

Ghost of Iran . . . Wood expressed fears the same results would follow action in the Suez situation as followed settlement of the Iranian dispute.

Then, he reminded Flemming, domestic producers were told that as Iranian oil reached the market, production from other Middle East areas would be reduced accordingly.

"We do not know whether that was provided for by those entering the Iranian consortium," Wood added. "We do know that there has been no such reduction in other areas."

The importing companies are the proper ones for government consultation on the foreign situation, Wood admitted. But when the question of our own productive capacity is involved, representatives of the domestic producers should be consulted, he said.

What about tankers . . . The tanker situation could well be the most difficult problem to solve in the event of cutting off Middle East canal or pipeline traffic.

Officials are not discussing the subject, pointing out that they first must have firm figures on tanker availability and routes. But many say privately it would be necessary to pool the tanker supply of the free world, and allocate tonnage where it is most needed.

One way of increasing the tanker supply, it has been suggested, would be to step up imports of oil from Canada into the U. S. West Coast area, freeing ships now used to bring oil across the Pacific.

The situation is expected to influence Flemming to spur the Military Sea Transport Service to more vigorous action to get high-capacity tankers built for long-term charter to the Government. The MSTS three times has turned down bids submitted and is now asking for a fourth round of proposals. Although the authority to make long-term charters of new tankers was granted many months ago, the MSTS so far has not contracted for any.

Arabs rising . . . While the western world examined its oil supply lines, the Arab world drew closer together in the crisis.

The Arab league, all but dead because of internal disputes before the Suez incident, apparently has been reborn.

Foreign ministers and representatives of eight Arab states besides Egypt resolved that any force used against Egypt would be regarded as an attack on the entire Arab world.

In the face of such solidarity, Britain made a move last week that might be interpreted as an effort to mollify the Arab world. Sir Charles Belgrave, political adviser to the Sheik of Bahrain, resigned. Belgrave, for more than 30 years one of the most influential westerners in the Middle East, has resisted the growing demands for his withdrawal for months.

He conceded last week in announcing that he had quit, that the move might ease tension. Belgrave has been the target of a strong nationalist move in Bahrain and other areas of the Middle East. The situation flared dangerously several months ago in a strike of workers, including oil workers. The Bahrain situation lends credence to charges that Nasser's agents are attempting to gain a club over western oil interests by infiltrating Arab labor organizations throughout the Middle East.

In Syria last week, the threat that any forceful move toward Egypt would mean cutting the oil pipelines was repeated. This time it was emphasized in that it emerged from a mass meeting of all Syria's political parties.

Canal traffic . . . Canal traffic was still moving as the conferences in London got under way.

Some shippers were paying their tolls to the Egyptian agency set up to take over the waterway. Most of them, however, were still paying tolls through the Suez Canal Co.

The only reported hitch in traffic involved a Japanese vessel, the Fujiharu Maru. Owners of the ship first reported it had been compelled to pay the toll to Egypt a second time after it had already been paid to the company. The Japanese shipping firm later said Egypt had required it to pay the tolls with a check on a Japanese-Egyptian open dollar account after holding up the vessel.

In the United States, the Suez crisis has had a very firming effect on the prices asked for used tankers. Prices for used tankers went so high last week that buyers weren't buying. In London, the shipping market was wary. In many cases shippers were insuring with Lloyds of London against the possibility of the longer haul around the cape. Insurance brokers said policies were being written for about 1 per cent of the added expense of the longer haul.

Egypt last week made its first move against westerners in the country. It suddenly arrested and deported two officials of Anglo Egyptian Oil Fields, Ltd. (Royal Dutch - Shell). Arthur Hawke, deputy chief engineer, and Henry Peuleve, assistant manager of the company's 44,000-bbl. daily refinery at Suez, were arrested and put aboard a Britain bound English tanker with no explanation.

What about Panama? . . . Counterproposals by Egypt that if Suez is internationalized same treatment should be given the Panama Canal are not being taken too seriously in Washington.

Consensus of United States officials is that relations between the Panama Canal Co. and Panama are different and much better than those between the Suez Canal Co. and Egypt.

There has been some dissatisfaction in Panama over the arrangement, but no serious threat of seizure has risen. Of course, a military coup by Panama would be impossible against our troops and defense bases in the area, even if such an idea should be entertained.

Like Suez, the Panama Canal is held under lease. But the lease covers the whole Canal Zone, which is governed in much the same manner as other United States territories.

In recent years, the Panama Canal has lost much of its military importance. Our largest carriers, for instance, are too big to traverse the waterway. The airplane has made obsolete many of its defensive features.

Also it does not serve the traffic that Suez carries. And, as far as our oil supplies are concerned, it is much less important.

Hydrafrac Case Settled

Stanolind wins claim that Magnolia has been using its process; Magnolia pays "considerable" sum in settlement

TULSA.—The legal battle over use of Hydrafrac, a formation - fracturing process patented by Stanolind Oil & Gas Co., has been settled by Stanolind and Magnolia Petroleum Co.

A consent decree was signed by attorneys for both parties and U. S. District Judge Royce H. Savage here last week. It resulted in dismissal of the case which has been hanging in federal court 18 months.

Full details of the settlement were not revealed but this much is known:

. . . **Stanolind** established validity of its fracturing patent and won its claim that the patented process covered operations being conducted on Magnolia's wells.

. . . **Magnolia,** by paying a "considerable" sum of cash and sharing certain of its patent rights relating to fracturing, acquired an unlimited worldwide immunity under all of Stanolind's fracturing patents.

Through this action Stanolind reportedly received licenses to the fracturing rights of Magnolia and its parent firm, Socony Mobil Oil Co.

As a result of the settlement, both sides asked in the consent decree that all claims for damages be dismissed with prejudice.

Stakes high . . . Outcome of the suit was closely watched by the oil industry.

Hundreds of oil wells are fractured each year. Twenty-eight different well-servicing companies are licensed by Stanolind to perform the Hydrafrac process. Royalty fee for each well is reported at about $44.

Stanolind's process consists of fracturing a hard and tight oil-bearing formation by forcing a mixture of oil and sand into the formation at high pressure.

The fight . . . Stanolind filed the original suit in February 1955, claiming Magnolia was infringing the patent and refusing to pay royalties.

Stanolind asserted Magnolia had used the process and paid royalties through service companies prior to April 2, 1954. After that date, Magnolia discontinued paying royalties but still contracted with well-service firms for the work.

Stanolind reported Magnolia's action influenced several other oil companies to discontinue royalty payments, although the majority continued to honor its patent rights. Stanolind brought suit to protect its interest in the process.

Magnolia filed answering briefs explaining its position. The company claimed an engineering survey of its wells subjected to Hydrafrac injections showed that formation fracturing was not involved. It said the charges for patent royalties thus were improper and argued that operations of its wells were not covered by Stanolind's patent.

Offshore Flow Cut

Louisiana's allowable for September off 12,000 bbl.

BATON ROUGE.—Production allowable for oil wells off the coast of Louisiana will be cut about 20,000 bbl. daily in September.

Conservation Commissioner John B. Hussey said the new "emergency" formula will give offshore wells a 50 per cent production premium over inland wells. A sliding scale now allots offshore wells up to three times the allowable of inland wells in the same depth bracket.

Because of new production estimated at 8,000 bbl. per day, the net cut in allowable for the entire state will be about 12,000 bbl. daily. Hussey said the allowable from inland wells will be increased from 39 per cent to 40 per cent of the base allocation set in March 1953.

Louisiana's August allowable is 746,829 bbl. per day, including 111,541 bbl. daily from offshore wells.

Describing the cutback in offshore allowables as "temporary," Hussey said he is continuing a study to determine whether the basic depth-bracket formula for controlling production should be changed. He denied that the new order was influenced by Louisiana's dispute with the federal Government over ownership of the tidelands.

Phillips Adding Cat Cracker

GREAT FALLS, Mont.—Phillips Petroleum Co. will replace its 1,200-bbl. thermal cracking facilities at its 2,800-bbl. refinery here with a catalytic cracking unit.

Estimated cost of the new unit is approximately $1,000,000.

Paul Jones, refinery manager, said foundation work is expected to be completed before winter. Installation of the cracker is scheduled to begin early next spring and to be completed in time for operation next summer. The unit has been contracted to Procon, Inc., of Chicago, which also will handle major construction work.

Tax Probe Assured

Senate group, others may study depletion allowance

WASHINGTON. — A new investigation of the oil and gas industry's depletion allowance appears already set for the 1957 session of Congress.

The inquiry would be made by the Senate interior committee. Chairman James E. Murray of Montana disclosed before leaving for the Democratic national convention that he has the probe "in mind."

"The effect of percentage depletion in inducing venture capital is fairly well known, especially in the oil business," Murray said. "This has enabled oil operators to accumulate vast capital."

Murray noted that depletion rates on other minerals range from 23 per cent down to 5 per cent. He did not indicate whether he thought the 27½ per cent for oil and gas production is too high.

He said, however, that "whether the allowable percentage depletion for specific minerals is too high or too low for the purpose of bringing out maximum production has not been adequately studied."

Depletion may also come up for consideration before other committees next session. It may be a subject of study by a House ways and means subcommittee which will open hearings in November on a number of tax problems. The joint congressional committee on taxation also is to make a study of a number of phases of the tax laws, but it has not been indicated whether depletion will be among them.

U.O.P. Forms Petrochem Unit

DES PLAINES, Ill.—Universal Oil Products Co. has formed a new department to direct commercial application of petrochemical processes licensed by the firm.

Board Chairman David W. Harris announced the new department will operate under supervision of M. D. Gilchrist, process sales vice president. H. W. Grote will direct the group's activities. At the same time it was revealed that E. R. Kanhofer, formerly manager of U.O.P. facilities at Riverside, Ill., has been named assistant to Col. J. C. Raaen, vice president in charge of research.

Pipeline Fights Swamps, Hills

VANCOUVER. — Good weather the past month has enabled construction spreads to exceed their schedules on the natural-gas line being built by Westcoast Transmission Co., Ltd.

Spring rains set them back considerably. But the delay has been offset and more than 120 miles of pipe is in the ground, it was announced by Frank M. McMahon, president of Westcoast Transmission.

The $153-million pipeline will bring gas from the prolific Peace River area of northwestern Alberta and northeastern British Columbia to much of British Columbia and to the U. S. Pacific Northwest.

The 30-in., 650-mile line will terminate at Sumas, Wash., and will have ultimate capacity of 650,000,000 cu. ft. daily.

McMahon said the steel strike had no effect on the project, which is due for completion in the fall of 1957. More than 403 miles of the 30-in. main-line pipe has been received and other materials are either on location or being shipped. Pipe has been supplied by British mills. More than 142 miles has been welded.

Perfect weather has put construction back on schedule. Spreads 1, 2, and 3 are laying pipe at the rate of a mile a day on the south-central portion of the line. They are operated by Dutton-Williams Bros., Ltd., Canadian Bechtel, Ltd., and Conyes Corp. Mannix, Ltd., is working from the south end of the line.

The above photo points up the problems encountered in a combination of swamp and alpine terrain. The Mannix spread shown is near Chilliwack, B. C. Terrain in the section from Chilliwack to Vancouver is spotted with peat bogs and has a high water table. To keep the ditch, the contractor has made extensive use of shallow sand points to remove water near the ditch route. A sand-point header is shown on both sides of the ditch.

Aerial crossings of the principal streams also are being built. Of the six suspended crossings, the first at Peace River is almost 20 per cent finished. Foundations have been completed at the Fraser River crossing at Shelley. Work is going ahead on the Thompson and other Fraser crossings. Excavation is under way at the Quesnel crossing.

Workers are busy at two compressor-station sites, No. 3 at Fort McLeod and No. 5 20 miles south of Quesnel.

Pipeline Work Resumed

COLORADO SPRINGS.—Work was resumed last week on the final leg of Colorado Interstate Gas Co.'s 380-mile, 22-in. natural gas line from Rock Springs, Wyo., to Denver.

Pipe-laying on the 238-mile section from Green River to Laramie was halted by the steel strike after the project had moved only 3.3 miles *(The Oil and Gas Journal, July 23, p. 57)*.

Crews were called back to work by the contractor, R. H. Fulton & Co., after 70 miles of pipe arrived from Kaiser Steel Corp., which was not affected by the strike.

The line has crossed the Green and Platte rivers and is building toward Laramie. The entire project is scheduled for operation by the end of 1956.

Imports to Rise

● California refiners will get more imported crude in last half of year

LOS ANGELES.—Crude-oil imports to the West Coast will be at a much higher level in the last half of the year than they were during the first 6 months.

Since the first of the year they've jumped from 134,000 bbl. daily to a July average of 218,000 bbl. daily. In June a year ago they were only 65,000 bbl. a day.

Present prospects are for a further increase.

Settlement of the strike at Shell Oil Co.'s Anacortes, Wash., refinery, for example, will double the June flow of 30,000 bbl. daily from Canada.

Too, Standard Oil Co. of California has announced it will begin this month to import 12,000 bbl. daily of Canadian crude for its Richmond, Calif., refinery. This marks the first time Canadian crude has been nominated directly by a California refiner. The few previous imports by Tidewater Oil Co. and Richfield Oil Corp. were strictly on a spot basis.

The rising imports haven't yet cut into California's production. There are two reasons:

. . . **There has been** a growth in demand in California comparable to the increased import rate.

. . . **California production** has shown a small, but steady, decline. West Coast output has dropped from 974,000 bbl. daily a year ago to 960,000 bbl. in July.

But independent producers feel that the imported oil has been largely responsible for holding down California crude prices. They figure that 35°-gravity Middle East or Venezuelan crude can be laid down at West Coast ports for 15 to 30 cents a barrel less than comparable crudes.

Trans Mountain plans . . . Another sign that West Coast imports will rise was an announcement by Trans Mountain Oil Pipe Line Co. that it expects August shipments of Alberta crude to Pacific Northwest refineries and for tanker movement from Vancouver to California refineries to top 135,000 bbl. daily for a new record for the line.

Trans Mountain recently announced plans to construct two additional pumping stations. They will boost the line's capacity to 175,000 bbl. daily.

This announcement, coupled with reports that the company is scheduling even larger shipments for September, indicate the August mark will be broken soon. Predictions are that September shipments will hit 150,000 bbl. daily.

VIEW AT SWIFT CURRENT RIVER crossing typifies rolling terrain cut by western section of Alberta-Montreal gas line.

Trans-Canada Snakes Across the Prairie

● Officials scotch reports that pipeline will not start natural-gas deliveries into Winnipeg before next summer

Paul Reed
Pipeline Editor

TORONTO.—Trans-Canada Pipe Lines, Ltd., will lay pipe as fast as it comes from the steel mills and will continue to push completion of the Alberta-Winnipeg section as long as weather permits.

This assurance came from Charles S. Coates, executive vice president and general manager of Trans-Canada. Coates spoke out following reports that a company official had told utility representatives that gas would not be available through Trans-Canada until next summer. Coates said that no Trans-Canada official had ever made such a statement.

The steel strike obviously will result in pipe deliveries later than the originally contracted schedules, Coates said. But until deliveries are resumed, the extent of the construction delay cannot be measured.

At Winnipeg natural gas will replace manufactured-gas distribution which has served the metropolitan area for many years. Natural gas first came to Winnipeg in 1953. A conversion from manufactured to natural gas and extension of natural-gas service will be continued after increased gas supplies become available from Trans-Canada.

Cost breakdown . . . The 2,250-mile Trans-Canada line from the Alberta-Saskatchewan border to Montreal was estimated to cost $378,000,000 before the steel strike. This included $121-$126 million for 600,000 tons of steel. Contract construction costs would be about $120,000,000 and freight charges about $22,000,000.

Most of the pipe for the project will come from Canadian and British mills. The $45,000,000 order for 30-in. placed with Welland Tube, Ltd., Welland, Ont., is the largest line-pipe order for the project. South Durham Steel & Iron Co.'s order for $32,000,000 for 200,000 tons is the biggest single contract a British company has ever obtained in Canada.

A $9,000,000 order for pipe on the Toronto-Montreal section was placed in October. The 574 miles of 34-in. pipe for the Alberta to Winnipeg line will be supplied by the National Tube Division of U. S. Steel Corp. at a cost of $35,000,000 to $40,000,000.

The section from Winnipeg to Toronto will be 1,263 miles, much longer than a recently published figure.

Ownership . . . The present ownership of Trans-Canada Pipe Lines, Ltd., is as follows:

	Per cent
Canadian Delhi Oil, Ltd.	24½
Western Pipe Lines Group	24½
British American Oil Co., Ltd.	17
Hudson's Bay Oil & Gas Co., Ltd.	17
Tennessee Gas Transmission Co.	17
Total	100

At the time of public financing, 51 per cent of the total number of shares to be outstanding will be offered to the Canadian public.

Present natural-gas reserves in Alberta are conservatively estimated at 16.5 trillion cubic feet. New reserves are expected at the rate of 1.3 trillion cubic feet a year. The 4.35 trillion cubic feet allocated to Trans-Canada should meet its requirements, as now estimated, for the next 25 years.

Gas supply . . . Signing of the first gas purchase contracts was announced by Trans-Canada on March 2, 1955. The contracts were signed with Hudson's Bay, Canadian Delhi, Canadian Export

Gas, Ltd., West Maygill Gas & Oil, Ltd., Great Sweet Grass Oils, Ltd., and Western Petroleum Leases, Ltd. They call for the purchase of more than 125 million cubic feet of gas daily, approximately one-quarter of the total capacity of the line.

On October 24, 1955, Trans-Canada signed a long-term sales and purchase contract with Canadian Gulf Oil Co. (now British American) for 1.3 trillion cubic feet of natural gas from the Canadian Gulf Pincher Creek field of southern Alberta. The contract calls for the purchase by Trans-Canada of a minimum of 100 million cubic feet of gas daily during the first year, and a minimum of 170 million cubic feet daily each year for the balance of the 25-year contract.

Early in March 1956, it was announced that Trans-Canada had signed contracts for the purchase of all gas required for present market requirements, with the gas to come from the following fields: Pincher Creek, Cessford, Provost, Atlee-Buffalo, Bindloss, Kessler, Sibbald, Oyen, Princess, Nevis, Homeglen-Rimbey, and Gilby.

Gathering system . . . In 1954 the Alberta government formed Alberta Gas Trunk Line Co., Ltd., to gather gas in Alberta and deliver it to Trans-Canada at the Alberta-Saskatchewan border.

Trans-Canada has been granted permission to obtain its gas from the following fields: Pincher Creek, Cessford, Provost, Atlee-Buffalo, Bindloss, Sibbald, Oyen, Princess, Nevis, Homeglen-Rimbey, Gilby, Duchess, Hamilton Lake, Kessler, and other small fields.

The initial gas for the Alberta to Winnipeg section will come from Bindloss field in eastern Alberta.

Compressor stations . . . Six compressor stations planned for installation at later phases of operation would be located and powered as follows: Burstall, Sask., 17,500 hp., and Swift Current, Sask., 10,500 hp. The remaining four will have the same horsepower initially as Swift Current. They will be at Moose Jaw, Sask., Deveron, Sask., McCauley, Man., and Bagot, Man.

Trans-Canada Pipe Lines, Ltd., affairs are directed by N. E. Tanner, president, Calgary. Coates, the executive vice president and general manager, is a former vice president of Tennessee Gas Transmission Co. J. C. Saks is gas supply manager and controller, Calgary; A. P. Craig is vice president in charge of sales, Toronto; Joseph Parrish is acting chief engineer; Kenneth E. Britain is division project engineer, Regina; and Carl Whitaker is construction superintendent, Swift Current.

Processing BRIEFS

NEW YORK. — Firestone Tire & Rubber Co. has announced plans to use the patented butadiene extraction and purification process of Esso Research & Engineering Co. in the Firestone butadiene plant at Orange, Tex. Capacity of the Firestone plant at Orange is 40,000 tons per year. Firestone's announcement brings to 400,000 tons the total Esso-licensed capacity.

CHEYENNE, Wyo.—Standard Oil Co. (Ohio) has appealed a federal court decision banning the use of the Sohio trademark in the 15-state marketing territory of Standard Oil Co. (Ind.). The decision, handed down July 12, forbade use of the trademark in Colorado, Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Montana, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin, and Wyoming.

DESTREHAN, La.—A polybutene plant is going up here at Pan-Am Southern Corp.'s 35,000-bbl. refinery. The plant will be the third in the Standard Oil Co. (Ind.) organization, the biggest producer of polybutenes.

The sticky, synthetic-liquid hydrocarbons are used in a variety of products, such as adhesives and sealing compounds, and by Indiana Standard in the manufacture of lubricating-oil additives. Another Indiana Standard subsidiary, Indoil Chemical Co., markets the polybutenes.

SALT LAKE CITY.—Salt Lake Refining Co., a subsidiary of Standard Oil Co. of California, has invited bids for a 6,000-bbl. Platformer planned at its 37,000-bbl. refinery here. The unit is scheduled for completion in 1 year. It will be the second catalytic reformer to be installed in the Salt Lake area. Utah Oil Refining Co. is building a 5,500-bbl. Ultraformer which will go on stream early next year.

Because of the altitude which gives refiners octane plusses, Rocky Mountain refiners are only now becoming pressed to boost quality. Engines upgrade gasoline about 2 research octane numbers per 1,000 ft. in the 90-octane range, and 1 number in the 97-octane level.

CLEVELAND, Ohio.—Standard Oil Co. (Ohio) is now on stream with its 10,000-bbl. per day Ultraforming unit at its 55,000-bbl. per day refinery here. The unit cost an estimated $4,100,000.

LOCKPORT, Ill. — The Texas Co. has awarded a contract to Foster Wheeler Corp. for design and construction of the 180-ton synthetic ammonia plant to be built here. The unit will use the Casale process and is expected to be on stream next year. It will utilize by-product hydrogen from Texaco's Hydroforming and Platforming units now operating at the 65,000-bbl. refinery.

JACKSONVILLE, Fla. — Sun Oil Co. is expanding its experimental multigrade gasoline marketing system into Georgia. This stage in the program will bring the tailormade blends of five gasoline grades to about 290 stations in Florida and southern Georgia.

GIBBSTOWN, N. J. — Hercules Powder Co. will double capacity of its cumene-oxidation operation here. The plant will make 6 million pounds of para-cresol annually. Also doubled will be production of di-tert-butyl-para-cresol. The operation is based on petroleum-derived propylene and benzene.

CLEVELAND.—A new polyethylene product designed to reduce evaporation of exposed liquids up to 70 per cent is being manufactured by American Agile Corp. at nearby Maple Heights. The polyethylene "pillows" form small floating covers for tanks. Only 1.1 lb. of polyethylene is used for a foot-square cover 1½-in. thick.

MERAUX, La. — Ingram Products Co. has put on stream a 3,000-bbl. Platformer at its refinery here. The U.O.P. unit, designed to produce a leaded gasoline with an octane rating of 98 or higher, is processing a mixture of Louisiana natural gasoline and gasoline from Louisiana crude oil. The installation is part of a multimillion dollar expansion program at the refinery.

WASHINGTON.—Persons who refine, mix, or blend used or reclaimed lubricating oils are not manufacturers subject to the federal tax on lubricating oils, the Internal Revenue Service held last week.

The IRS reversed previous regulations which had included reclaimed oil as taxable. In practice, however, the tax has not been collected, and the new regulation merely formalizes that position.

The IRS last week also held a hearing on proposed regulations relating to the taxability of expenditures for research and experiment. The new regulations, now to be put in final form, will settle a number of questions that have arisen as to the deductability of such costs.

Crisis Arising in Headlee

Texas Gulf Producing asks 3 producing days a month, says operators face huge losses unless field quickly unitized

AUSTIN. — Operators in the mushrooming Headlee Devonian field in West Texas stand to lose 50,000,000 bbl. of production.

That is the startling report of Texas Gulf Producing Co., which last week went before the Texas Railroad Commission with an unusual request. It asked that production in the field be cut back to only 3 days a month.

Texas Gulf Producing is alarmed over fast-dropping reservoir pressure in the big gas and distillate field straddling the Ector-Midland county line.

Headlee pressure, its engineers argued, will fall below the saturation level in about 255 more producing days at present drainage rates. If this occurs before the field can be unitized and pressure maintenance started, it will cost field operators more than 50,000,000 bbl. of production.

Robert H. Parks, engineer for the company, said a pressure-maintenance project launched after reservoir pressure has fallen below the saturation level could add little, perhaps nothing, to primary recovery.

The estimated 255 producing days left before pressure falls too far, he said, will pass at current production rates before a unit agreement can be finalized, engineering studies completed, and necessary equipment ordered and installed.

The field operators' committee has agreed unanimously, Parks said, that pressure maintenance should begin before pool pressure drops below the saturation point. And efforts to unitize are now under way. He argued that the proposed 3-day-a-month producing rate would give the operators time to get the project going.

Parks said he feels a gas-injection program is feasible for Headlee and would recover about 73,500,000 bbl Primary operations, he estimated, would net only 17,625,000 bbl.

Original reservoir pressure when the field was discovered in August 1953, he said, was 5,400 psi. at 8,875 ft.

A 10-well test program showed average field-wide pressure had dropped 342 psi. to 5,058 psi. as of June 1, 1956, he said. He placed saturation pressure at 4,450 psi.

Opposition voiced . . . Herman H. Kaveler, representing Carlton Beal & Associates, argued strongly against cutting back field production so sharply.

The present rate of production and method of operation aren't causing waste and shutting the field down pending unitization and pressure maintenance would be unreasonable, he said.

Unitization should not be considered, he said, until the reservoir limits are reasonably well defined. He contended that it would be a serious error to set up a pressure-maintenance program in a part of the pool, leaving those outside the unit in a position to "take a free ride."

Moreover, Kaveler said, there is grave doubt that gas can be pumped into the tight Devonian pay of the reservoir economically. He argued that water injection would be more efficient.

The Beal spokesman took issue, too, with the pressure figures submitted by Texas Gulf and with the latter's contention that one well would efficiently drain 160 acres in the field, supporting 80-acre spacing instead.

He said he felt that Headlee pressure was declining at a normal rate of about 80 psi. a year. He placed original pressure at only 5,200 psi. and also felt that pressure at the June-July survey this year was higher than reported by the operators.

Kaveler said that in his opinion Headlee is an oil reservoir rather than a gas-condensate pool. He pointed out that the produced fluid is below 50° gravity. Distillation tests have shown that the fluid is crude oil rather than condensate, he said.

Merger of fields? . . . The commission also was pressed by Beal in a consolidated application to merge Headlee Devonian with the adjoining Dora Roberts Devonian field.

Kaveler and William B. Ellis, geologist for Beal, said evidence was overwhelming that the two fields produce from the same reservoir.

Parks of Texas Gulf also backed this view. He pointed out that the fields are now only a mile and a half apart and that there is no known barrier separating them.

Headlee Devonian now has 33 producing wells . . . Dora Roberts Devonian only four. Headlee as of June 1, 1956, had produced 915,686 bbl. of stock tank liquid and 2,947,247 M.c.f. of gas since its discovery. Dora Roberts Devonian produced 129,195 bbl. and 435,024 M.c.f. to the same date.

Parks estimated the Devonian would be productive under 6,740 surface acres in Headlee and 4,500 acres in Dora Roberts.

Kaveler placed Devonian reserves of the two fields at 440,000,000 bbl.

Tribe Pushes Deal

Navajos protest rejection of Delhi-Taylor agreement

WASHINGTON.—Review by the Interior Department of its rejection of a proposed exploration contract between the Navajo Indian tribe and Delhi-Taylor Oil Corp. is being sought by the tribal council.

The contract was turned down last month by Interior Secretary Fred A. Seaton. He ruled it was in effect a lease agreement of doubtful legality under existing law and was made without competitive bidding *(The Oil and Gas Journal, July 30, page 121)*. Industry critics of the deal shared this view.

The arrangement would give the oil company exploration rights on some 5,365,000 acres of Navajo lands over the next 25 years. The profits from any oil developed would be split equally between the Indians and the company after deduction of some development costs.

Tribal position . . . Paul Jones, chairman of the tribal council, criticized Seaton for rejecting the deal giving Delhi-Taylor exclusive rights to nearly one-third of the reservation.

Jones, in a letter to the Interior secretary, charged that he overruled the proposal without obtaining a legal opinion. He said Seaton acted "obviously in response to a well-organized publicity campaign by companies interested in destroying the new approach." He urged Seaton to reconsider the contract or establish regulations for offering a similar contract on a competitive bid basis.

New Polyethylene on Market

KANSAS CITY.—Spencer Chemical Co. announced it has developed the first commercial quantities of high-density polyethylene from a high-pressure-type plant. The new product will come from Spencer's 45,000,000-lb. yearly works at Orange, Tex.

Properties claimed for the new product includes densities of 0.935 to 0.940; stiffness of more than twice conventional polyethylene; and tensile strength a third greater than conventional type of like melt index.

Spencer expects the new petrochemical product to find usage for auto battery cases, pipe fittings, and industrial parts.

RICHFIELD'S floating-roof tanks, right, and flotation cells, left, keep air sweet as . . .

Smog Bows to Skimming Operation

LOS ANGELES. — The problem of skimming waste water under a set of tough antismog regulations has been neatly solved by Richfield Oil Corp. at its 136,500-bbl. refinery here. And the system is paying off handsomely.

The usual procedure of skimming in open pits sends pollutants into the air—something that is frowned on heavily by Los Angeles pollution-control officials. So Richfield, in effect, put a lid on its operations.

The secret is two floating-roof preskimming tanks and two air-flotation cells equipped for vapor recovery. The system treats some 65,000 to 70,000 bbl. of waste water daily, recovering from 500 to 600 bbl. of oil.

One of the big advantages of the dissolved-air flotation method is the short retention time required—only 20 minutes. Over-all retention time of the system is about 4 hours.

Another attractive feature of the air-flotation cells is their ability to handle a high volume of water. This results in low treating costs. Other than sulfuric acid and caustic for pH control, no chemicals are used.

Cost of skimming off the oil is about 2½ mills per barrel, including depreciation. Installation cost of the units was about $165,000.

Effectiveness of the system is pointed up by a before-and-after comparison of the oil content of the waste water. The water enters the flotation cells containing 100 to 125 p.p.m. of oil. This is cut to 30 to 45 p.p.m. by air bubbling up through the mixture.

Escaping hydrocarbon vapors and air released in the tank are removed from the flotation cells through a vapor-recovery line. After skimming, the waste water is relatively free of pollutants. It can be flushed down any sewage line.

Capsized Barge Poses Problem

NEW ORLEANS.—Shipyard officials last week were studying means to upright a 2,500-ton drilling barge which capsized in the Mississippi River near here.

The $1,500,000 vessel turned upside down August 10 in water about 90 ft. deep just off the docks of Avondale Marine Ways, Inc. Three workmen were killed, a fourth was presumed dead, and at least five men were injured in the mishap. About 40 men were on board as the vessel started listing without warning. It rolled over within about 5 minutes.

Avondale was nearing completion of the barge when it suddenly capsized. The barge was being built for Southeastern Drilling Co. and The California Co. It had been scheduled to start operations soon in the Bay Marchand area for The California Co. It was designed for 25 ft. of water.

The barge was being kept afloat last week by air pumped into the hull. There was some discussion that the vessel might be towed to midstream for an attempt to upright it.

"I'm not sure it can be righted," said one shipyard official. "The engineers are trying to figure what it would take to lift it. They may build a model and make calculations from that to find out where the weights are."

The capsized vessel is about 156 ft. long and 90 ft. wide.

It was the second drilling barge to overturn in the Gulf Coast area. Last year a $2,000,000 vessel owned by American Tidelands, Inc., turned over on its side in 37-ft. of water while being towed to location, after completing its first well off the Louisiana coast (*The Oil and Gas Journal, June 27, 1955, page 69*).

B.A. Offset Staked

Two confirmation tests to evalate salt-dome strike

DALLAS.—Two new tests on the Hainesville salt dome in East Texas should help evaluate the size of British-American Oil Producing Co.'s recent Woodbine discovery.

British-American has staked location for a confirmation test, the 1 Victoria Buffington Warlick, 1,450 ft. west of its 1 Bessie Weisenhunt strike 6 miles northeast of Mineola in Wood County.

Trice Production Co. and F. R. Jackson, Longview, Tex., independent, are preparing to spud in a Woodbine test, the 1-A A. C. Wood estate, about 3 miles to the north of the B.A. strike. The Trice well is on a 153-acre tract in Peter Tidwell Survey.

British-American completed the discovery for a flow of 259 bbl. of oil daily through ¼-in. choke (*The Oil and Gas Journal, August 6, page 59*). Production was from perforated intervals at 9,217-22 ft. and 9,228-47 ft.

The company has blocked out about 6,300 acres in leases around the spine of the Hainesville dome. The strike has spurred new activity around other nonproductive domes in East Texas.

Rotary Slump Stops

HOUSTON.—The slump in active rotary rigs, started by the steel strike, appears to have leveled off.

Activity in the United States increased last week for the first time in 8 weeks. As of August 13, Hughes Tool Co. reported 2,525 rigs active, 5 more than the week before. Declines of 38 in Texas, 5 in Wyoming, and 4 in Illinois were more than offset by upturns of 18 in South Louisiana, 11 in Oklahoma, 19 in Kansas, and 7 in Colorado.

The modest increase still left active rotaries 217 below the June 25 figure the week before the strike started and 210 below August 15, 1955. The current total is the lowest since February 13. Activity may be several weeks returning to normal while pipe mills try to catch up on back orders. Pipe is expected to continue tight the rest of the year.

Crude Imports Reach New High

CRUDE imports set another all-time record in June with a daily average of 969,200 bbl. compared with the previous high of 963,500 bbl. reported for May. These totals are from regular monthly reports by the Census Bureau of the Department of Commerce.

The June record was the fifth to be established in a period of 12 months. Crude imports during June 1955 topped all previous months. The continuing climb by crude imports brought three new records in 1955. These were in August, November, and December. So far this year, May and June have been added to the list of record-breaking months.

A revision is expected for product imports, but as reported by the bureau, the totals established two other records. Total product imports amounted to 14,714,000 bbl. or 491,000 bbl. daily. This is the highest average ever reported for June. Product imports, mostly residual fuel, tend to drop off during the summer months when there is no demand for residual fuel for heating.

Gasoline total questioned . . . The second product record for June is believed to be due to an error in reporting or tabulating imports.

The Census Bureau's report shows June gasoline imports at 2,466,518 bbl. or 82,200 bbl. daily. If this total is correct, it represents an all-time record for gasoline imports.

The reported total for gasoline is broken down into 205,138 bbl. from Canada, 605,131 bbl. from Netherlands West Indies, and 1,653,596 from Trinidad. This last figure has been questioned, especially 1,547,991 bbl. reported as received at New York. If these gasoline totals are revised, the corrections will be shown next month.

Other significant totals from the June report are:

. . . Crude from Colombia was at the highest level since August 1954.

. . . Imports from Kuwait averaged 156,900 bbl. daily, surpassed only by records for June 1955 and May 1956.

. . . Crude from Iraq set a new all-time record with 45,800 bbl. daily. The previous record was 38,000 bbl. daily last March.

. . . Imports of crude from Iran averaged 30,000 bbl. daily, the highest since the return to operation under the consortium.

. . . Crude imports from Canada averaged 74,900 bbl. daily, the lowest since last December. Receipts for refineries in Washington averaged only 24,800 bbl. daily compared with 75,000 bbl. daily last March.

Total exports averaged 290,400 bbl. daily in June compared with 297,300 in May and 343,400 in June last year. Distillate and residual exports in June were up from May but the gains were more than offset by decreases for crude and all other major products.

IMPORTS INTO CONTINENTAL U. S.
(Thousands of barrels)

	June 1956	May 1956	June 1955
Crude—			
Mexico	603	493	680
Colombia	981	860	755
Venezuela	13,584	14,021	11,398
Peru			123
Ecuador		123	
Kuwait	4,707	5,636	5,528
Saudi Arabia	2,666	2,974	2,323
Neutral Zone	195		407
Iraq	1,374	931	589
Iran	901	446	
Qatar	734	429	763
Canada	2,246	3,019	1,108
Far East	1,087	938	716
Total crude	29,078	29,870	24,435
Daily average	969	964	815
Products—			
Residual fuel	11,359	13,425	10,198
Other products	3,355	1,403	1,586
Total products	14,714	14,828	11,775
Daily average	491	478	392
Total all oils	43,792	44,698	36,210
Daily average	1,460	1,442	1,207

EXPORTS*

	June 1956	May 1956	June 1955
Crude	866	1,236	1,053
Gasoline	1,893	2,036	2,128
Kerosine	209	325	221
Distillate	1,544	1,312	2,161
Residual	2,138	1,820	2,460
Lube oils	1,135	1,307	1,217
Other products	926	1,182	1,061
Total all oils	8,711	9,218	10,301
Daily average	290	297	343

*Excludes shipments to territories.

Wyoming Pipeline Planned

CHEYENNE, Wyo.—Powder River Pipe Line Co. of Billings, Mont., is planning a 20-mile, 6-in. crude pipeline east from Donkey Creek field, near Moorcroft, Wyo., to Butte Pipe Line Co.'s line.

The firm expects to move about 2,000 bbl. of crude daily. Proposed rate is 20 cents a barrel, 10 cents for gathering and 10 cents for transmission. An application for approval of the project estimates the cost of the line and gathering system at $554,000.

Powder River operates 78 miles of 6-in. line from Central Montana's Sumatra field to the Billings-Laurel refining area.

Industry BRIEFS

WASHINGTON.—American Louisiana Pipe Line Co. has been granted temporary authority by the Federal Power Commission to build and operate additional compressor facilities to boost its capacity by 60,000 M.c.f. to 360,000 M.c.f. Cost of the two new 12,000-hp. compressor stations and extra 2,000 hp. at two other stations is estimated at $8,658,000.

The company has another request before the FPC for two other compressor stations which would boost daily delivery capacity by 40,000 M.c.f. American Louisiana recently completed its trunk line from the Gulf Coast area to the Detroit market.

DALLAS.—Byrd Oil Corp. has purchased half interest in 38 wells on 890 acres in White and Edwards counties, Illinois, from Walter Duncan and Yale H. Lewis. The production acquired totals 260 bbl. daily. The deal involved an oil payment equal to $640,000, plus an undisclosed amount of common stock.

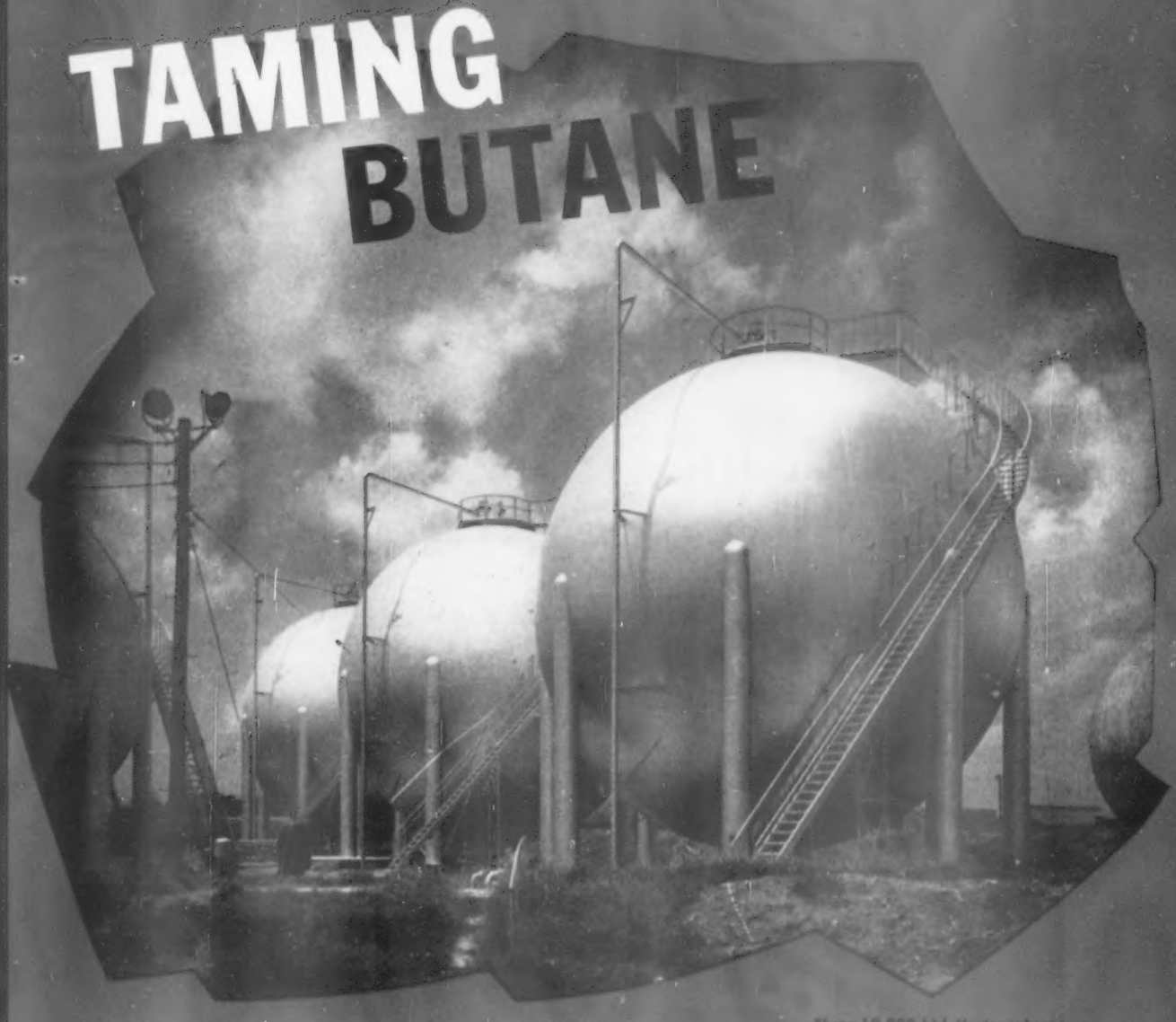
TORONTO. — Devon - Leduc Oils, Ltd., will absorb Rio Palmer Oils, Ltd., if stockholders of both companies approve the deal. Devon-Leduc would increase authorized common stock to issue 1¼ shares for each share of Rio Palmer stock. Both companies own producing properties and Rio Palmer, which has seven rigs, does contract drilling. R. L. Wheeler, president of Devon-Leduc, is to become chairman, and Morris Palmer, president of Rio Palmer, will be president of Devon-Leduc and director of field operations.

DALLAS.—Magna Oil Corp., Dallas, has acquired interests in 281 oil wells and 134 gas wells in the Texas Panhandle through a cash purchase of the capital stock of Johnson Ranch Royalty Co., Inc., Amarillo, Tex. The Johnson properties included 5,333 acres of producing leases and 2,450 acres of nonproducing leases.

STERLING, Colo. — Shell Oil Co. has sold its holdings in the Atwood East field in Logan County, Colorado, to Excelsior Oil Corp., wholly owned subsidiary of Kansas-Nebraska Natural Gas Co. Excelsior acquired about 2,000 acres of oil and gas land containing five producing oil wells and two shut-in gas wells. The purchase price was not disclosed.

Excelsior will drill three wells on the new holdings in the near future. The transaction marked the entry of Excelsior into oil production in Colorado.

TAMING BUTANE



Three 10,000-bbl. Hortonspheres designed for a working pressure of 80 lbs. per sq. in. They are used to store butane for the Warren Petroleum Corporation, Houston, Texas.

Butane is stored under pressure to prevent it from disappearing into the atmosphere. Hortonspheres®, designed to withstand internal pressure, will tame this exceedingly volatile hydrocarbon. No vapor can escape as long as the internal pressure does not exceed the setting of the pressure relief valves.

Hortonspheres are built in standard capacities to 30,000 bbls. and for pressures up to 217 lbs. per sq. in. in the smaller sizes. Write our nearest office for further information.

CBI

Chicago Bridge & Iron Company

Atlanta • Birmingham • Boston • Chicago • Cleveland • Detroit • Houston
Los Angeles • New York • Philadelphia • Pittsburgh • Salt Lake City
San Francisco • Seattle • Tulsa
Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PA.

Investigate the profitable way of doing business afforded you by private executive aircraft ownership — ask about Beechcraft's attractive leasing or financing plans.

THE BEAUTIFUL BEECHCRAFT BONANZA —

Buy It and Fly It For 2½¢ Per Seat Mile!

You can operate and pay for the finest single-engine aircraft ever built for as little as 2½ cents per seat mile! This includes *all* expenses — hangar rent, fuel, maintenance, full insurance coverage — even depreciation!

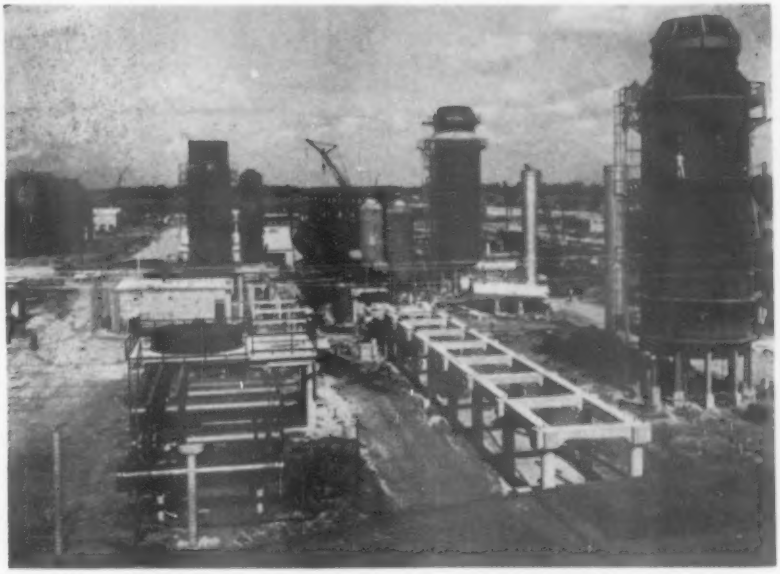
Use your Beechcraft Bonanza an average of 50 hours per month and your total cost of ownership and operation can be as low as 2½ cents per seat mile. Fly 30 hours per month (the average of all Bonanza owners) and your per seat mile cost is approximately 3¼ cents. *No other airplane* offers you so much for so little cost!

And here's what you get for your money: *The four-place Beechcraft Bonanza for '56 is the fastest, quietest, most rugged and most luxurious single-engine airplane on the market* — years ahead of others in its field.

Before you buy *any* airplane, get the facts from your Beechcraft distributor or write Beech Aircraft Corporation, Wichita 1, Kansas. You'll go *first class* and actually *save money* in a Beechcraft!

Beechcraft

BEECHCRAFTS ARE THE AIR FLEET OF AMERICAN BUSINESS



MAZE OF TOWERS and vessels near Houston mean . . .

Texas Butadiene's Plant Taking Shape

HOUSTON.—Work is more than half completed on Texas Butadiene & Chemical Corp.'s $30-million plant at nearby Channel View. More than 900 craftsmen now employed at the 400-acre site are expected to have the plant ready for operation by the first of the year.

The multipurpose butadiene plant will utilize the Houdry fixed-bed catalytic dehydrogenation process and a furfural extraction unit licensed by the Perco Division of Phillips Petroleum Co. Fluor Corp. is doing the engineering and construction work.

Progress of work is shown in photograph of dehydrogenation area above. Quench and pre-quench towers are in rear with combined feed heaters at right center. At the right is structure for the first reactor unit. Quench oil coolers are in left foreground.

The plant is the first of its type. Annual production will be 56,000 tons of butadiene, 2,532,000 bbl. of aviation gasoline, and 83,000 bbl. of alkylate.

Union Quitting Publicity Groups

LOS ANGELES.—Union Oil Co. last week withdrew its "financial and active support" of the oil industry's organized public-relations program on the West Coast.

A bulletin to Union officers and department heads asked that all employes serving on either the American Petroleum Institute's Oil Industry Information Committee or the Western Oil and Gas Association's Oil Information Committee be notified of the new policy.

The bulletin, issued by C. Haines Finnell, Union advertising and public relations director, did not criticize the policies or activities of either committee. It blamed, instead, the current brawl over the pending Proposition 4, an initiative referendum which would give California a new conservation law.

"The companies supporting Proposition 4, who are also members of these committees, have elected to initiate and conduct a public name-calling campaign of the worst kind in an attempt to justify the position they have taken," the bulletin said.

"Other members of the industry, your company included, have been called 'despoilers of our natural resources,' 'irresponsible operators,' and worse.

"Therefore we cannot, in all honesty, continue our activities on these two information committees . . ."

Union is the only integrated company in the state which is opposed to the proposed law.

Since there seemed to be no quarrel between Union and the information agencies, there was optimism in the industry outside California that the rift would be only temporary.

Sweet Deal Sours

Oklahoman withdraws rigs from New Brunswick field

MONCTON, N. B. — An Oklahoma independent is pulling his rigs off a 10,000-sq.-mile New Brunswick lease, looser in one of oil's most unusual and sweetest-sounding deals.

Orville H. Parker, of Ponca City, announced the move after he failed in his bid to approximately triple production for New Brunswick Gas & Oil Fields, Inc., on the Canadian firm's big concession in the Stony Creek field area.

The gamble started March 1, 1955. Within 500 days from that time, Parker was to boost output from about 300 bbl. a week to 3,600 bbl. a month. If he succeeded, he would receive half interest in the lease, including already-established production *(The Oil and Gas Journal, June 20, 1955, page 63)*.

There were problems, but the deal looked like a shortcut to riches. And for a time, Parker appeared a shoo-in to collect.

Results of some $3,000,000 worth of exploration work were turned over to him and he decided to drill his first test in Stony Creek field between two marginal producers.

He spudded in with a water-well machine, when his cable-tool rigs failed to arrive in time at the remote field, and within 6 weeks had found promising oil flows.

But what then appeared to be a 100-bbl.-daily potential—enough to hit the jackpot—turned out to be a stingy 15-bbl. producer. Further tests failed to develop the needed production.

Blackwell Merger Planned

CUSHING, Okla.—Merger of Mul-Berry Oil Co., Cushing, into Blackwell Oil & Gas Co., Tulsa, was approved here last week by directors of both companies. The plan will be submitted to stockholders of both firms late in September.

Mul-Berry produces 300 bbl. daily from 42 net wells in Oklahoma and Texas. Blackwell produces 1,082 bbl. from 145 net wells in Oklahoma, Kansas, Texas, and Louisiana. All but one Mul-Berry stockholder is a stockholder in Blackwell.

Paul R. Shultz, Blackwell president, said a merger would eliminate duplication of activities and would permit Blackwell to undertake projects not now possible.

The companies are among Oklahoma's oldest. Blackwell was formed in 1904, Mul-Berry in 1917.

Onassis Clears Slate

Greek tanker magnate sets up American trust; proposed board includes three officials of W. R. Grace interests

WASHINGTON. — The Justice Department last week closed the books on its drive against the shipping interests controlled by A. S. Onassis, charged with violation of the maritime laws in connection with the purchase of surplus government tankers.

In the course of its campaign, the department seized 23 vessels allegedly purchased illegally by noncitizen corporations controlled by Onassis.

Last December, Atty. Gen. Herbert Brownell, Jr., announced that a settlement had been agreed upon. The Onassis companies were to pay the Government $7,000,000 and reorganize to insure American citizen ownership and control.

The seized vessels were to be turned back to the companies, which still had some $5,500,000 in mortgages to pay. This would save the Government $30,000 per year per vessel in layup costs and some $90,000 each for reactivation, Brownell said.

Brownell announced last week that the Onassis interests were living up to the agreement. So far, $4,000,000 of the $7,000,000, payable in installments, has been received.

The trust . . . A trust indenture executed August 10 by the Onassis interests transfers a majority of the stock of U. S. Petroleum Carriers, Inc.; Victory Carriers, Inc.; Western Tankers, Inc.; and Trafalgas Steamship Co., which owned 21 American flag vessels, to the Grace National Bank of New York as trustee.

Each of these corporations will have a new board of directors and four of the five members will be American citizens selected by the trustee as the new controlling stockholder.

The directors . . . In line with this requirement, new directors for the group of companies have been proposed. They are John C. Griswold, executive vice president of W. R. Grace & Co.; Rear Admiral Edmond J. Moran, president of the Moran Towing & Transportation Co.; Charles S. Cunningham, partner in the law firm of Kirlin, Campbell & Keating and a director of Grace National Bank; and E. Tinsley Ray, vice president and trust officer of Grace National Bank.

The trust indenture permits the trustee to build supertankers in the United States, subject to the approval and requirements of the U. S. Maritime Administration. Such a program had been started by Onassis.

Penn Grade Raised

11-cent increase is area's seventh boost in a year

BRADFORD. — Adjustments were made in Pennsylvania Grade crude prices, effective August 16. For some areas, this is the seventh increase in 12 months.

Joseph Seep Purchasing Agency of South Penn Oil Co. posted an increase of 11 cents a barrel for Bradford crude in both Bradford Transit and National Transit lines. The raise brings the current posting for Bradford crude to $4.68 a barrel.

Middle District and Southwest Pennsylvania crudes were raised 6 cents a barrel to give Middle District producers $4.50 a barrel and Southwest Pennsylvania $4.21.

No increase was posted for West Virginia crude in the Eureka line, leaving the posting at $4.03 a barrel.

The Seep agency does not post prices for Buckeye and Zanesville grades.

National Transit Co. and Eureka Pipe Line Co. received permission to increase pipeline charges effective August 16. The Seep agency reports that the adjustments in crude postings were made to maintain crude-oil delivered costs on a competitive basis for refineries located in the area from Butler to Warren.

Key Tax Case to be Heard

DENVER.—The Colorado Supreme Court has upheld The California Co.'s right to challenge the constitutionality of Colorado's so-called oil and gas severance tax.

The tribunal ordered the Denver District Court to proceed with trial of Calco's suit against the state demanding refund of $947,430 in severance taxes paid April 15, 1954, plus interest since that date on the contention that the levy is unconstitutional and discriminatory.

The Supreme Court issued the order in rejecting a motion by state Atty. Gen. Duke W. Dunbar seeking to kill the suit on grounds the state is immune from suit in its own courts. This argument has been denied twice in District Court.

Although the action involves a specific sum, the outcome will affect millions of dollars of severance taxes paid to the state by all oil companies operating in Colorado since the levy was first imposed in 1953.

U.O.P. Agent Hit

Filtrol says trustee slips finance data to bank firm

ALBANY.—The proposed sale of Universal Oil Products Co. hit another snag last week.

Filtrol Corp., a prospective purchaser, accused the U.O.P. trustee of playing favorites. The company, in a supplementary petition filed with the New York Supreme Court, asked the court to take the sale out of the hands of Guaranty Trust Co., which holds U.O.P. stock in trust for the American Chemical Society.

Filtrol charges . . . The petition alleges that Guaranty Trust may be extending information on U.O.P. to an investment banking firm to the exclusion of other prospective bidders.

The firm, unidentified, is said to have solicited participation of other financial houses in a group which would underwrite the purchase of U.O.P. On this basis Filtrol asks that another agent be named to handle the sale for a reasonable commission. It proposes a bidding procedure which would give all prospective buyers equal access to information necessary to submitting fair offers.

Filtrol in an earlier petition asked that U.O.P. be sold by sealed bid *(The Oil and Gas Journal, August 6, page 53).*

Other road blocks . . . Whether the Supreme Court will approve the sale remains to be seen.

A.C.S. wants to dispose of the stock and diversify its portfolio to provide a better yield for research projects over the years. But a decision awaits a thorough review by a referee of all aspects of the sale request by Guaranty Trust. The referee, William J. O'Shea of New York, is on vacation. He presumably will not take the case under study until after Labor Day.

Meanwhile, Guaranty's petition is under fire from two other sources. The New York state attorney general has attacked the 10 per cent commission sought by Guaranty. Some independent refiners also plan to oppose the sale on grounds that it will prove counter to the interests of refiners using U.O.P. licenses and services.

LEE C. MOORE TRAILER MOUNTED MASTS

DESIGNED
to fit your needs

Lee C. Moore designs trailer mounted masts to accommodate a wide range of drawworks and powers. Our close collaboration with other manufacturers assures the drilling industry of drilling rigs best suited to specific requirements.

- **SINGLE TRAILER MOUNTED MASTS**

  86 ft. 94 ft. 97 ft. 97 ft. Heavy duty 100 ft. 126 ft. Export model

- **DUAL TRAILER MOUNTED MASTS**

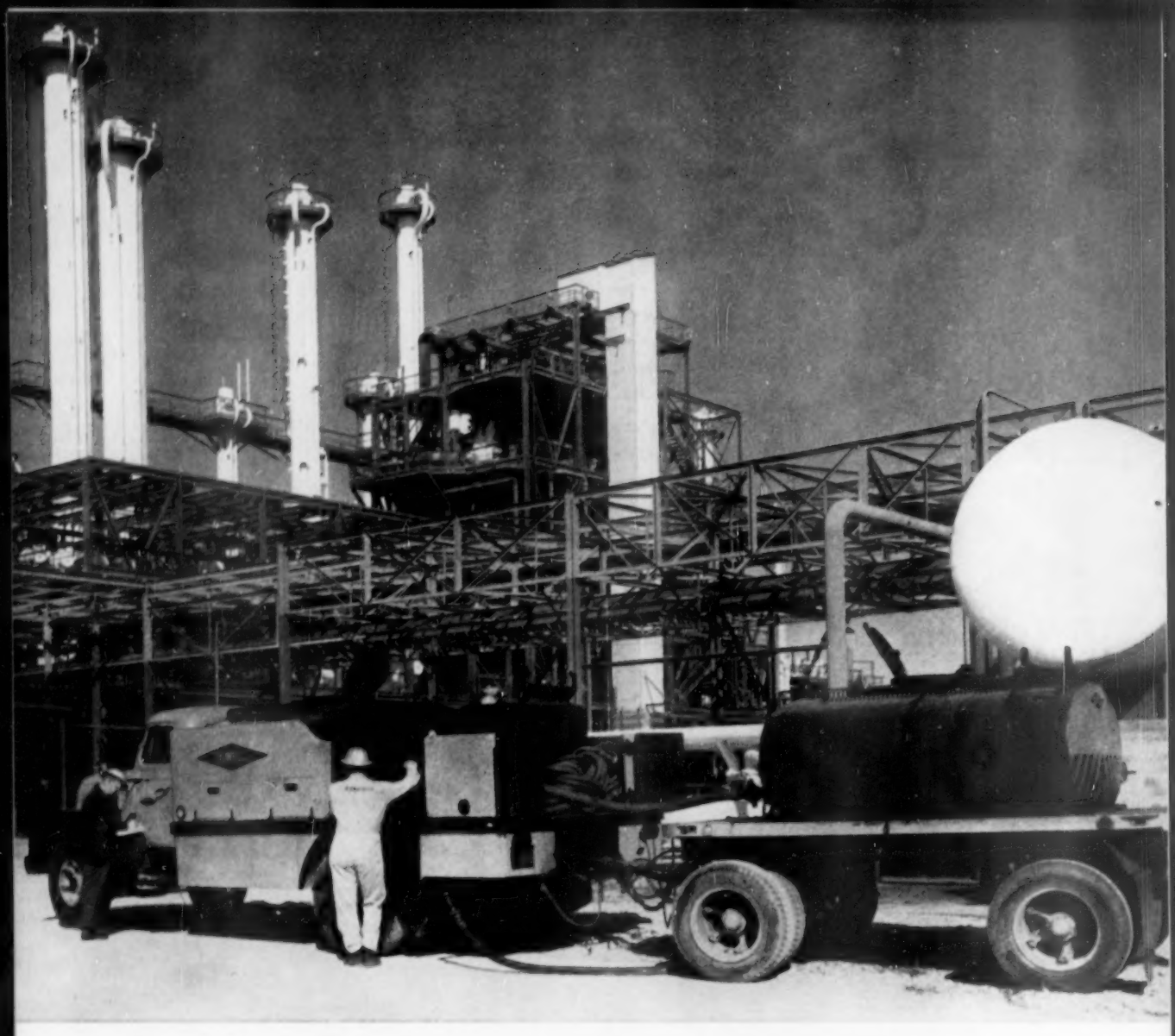
  97 ft. 100 ft. 126 ft. 126 ft. Export model

LEE C. Moore CORPORATION

TULSA : SHREVEPORT : GREAT BEND : CASPER : NEW ORLEANS
CENTRALIA : DALLAS : HOUSTON : MIDLAND : PITTSBURGH

EXPORT OFFICE:—ROOM 624, INTERNATIONAL BLDG., 630 5TH AVE., NEW YORK 20, NEW YORK

FOREIGN LICENSED MFR. OIL WELL ENGINEERING CO., LTD., CHEADLE HEATH, STOCKPORT, ENGLAND



IT'S NOT WORTH THE CHANCE —CLEAN IT RIGHT

Equipment that operates at less than peak efficiency eats into your company profits. Chemical cleaning can help stop these losses—but only when it's done by experts. Unless you rely on experts, you're taking a chance with your men and valuable equipment.

Dowell engineers understand your cleaning problems and they have the *experience* needed to solve them. Thoroughly trained, they're backed by Dowell's 15 years' experience in removing troublesome scale deposits from virtually every kind of equipment in every kind of industry. They're aided, too, by a completely modern, fully staffed and excellently equipped *research* laboratory.

But, expert cleaning goes beyond keeping your equipment in top condition. Dowell considers the safety of company personnel at every step of the operation. The safest possible working procedures are worked out with your safety personnel.

Call Dowell. Our engineers are always ready to discuss chemical cleaning problems with you. There's no obligation. Or write Dowell Incorporated, Tulsa 1, Okla., Dept. H-11.

chemical cleaning service for industry **DOWELL**

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

New Sinclair Deal

Company pays $47,000,000 for Texas Pacific interest

NEW YORK.—Sinclair Oil Corp. has completed its third major deal in a little more than a year to beef up its crude reserves.

The company contracted to buy about 1,100,000 shares of stock in Texas Pacific Coal & Oil Co., Fort Worth, for around $47,000,000. This gives Sinclair a 30-per cent stock interest in the company. There are 3,600,000 shares outstanding.

The deal, like the recent one involving Southern Production Co., was long rumored but denied by Sinclair as recently as last May.

Texas Pacific properties . . . Texas Pacific is producing more than 21,000 bbl. of oil daily.

Its own estimate of crude-oil reserves is 109 million barrels. The company issued its new reserves figure March 31 coinciding with estimates by three independent engineering firms retained to make separate studies. They came up with totals ranging from 75 million to almost 115 million barrels.

Since 1948 the company has produced and sold some 54 million barrels, more than its total reserves estimated for that year.

The company figures its gas reserves to be 525.7 billion cubic feet. The engineering firms calculated them at 272.5 billion to 530 billion cubic feet.

Previous deals . . . The latest move underscores Sinclair's drive to improve its crude-oil production, now less than 30 per cent of refinery runs.

Last month Sinclair agreed to buy Southern Production, another Fort Worth firm, for $107½ million. Completion of the deal awaits stockholder approval and favorable tax rulings on production payments. This will add some 21,000,000 bbl. of liquids and 525 billion cubic feet of gas to Sinclair reserves plus interests in refining and pipelining properties *(The Oil and Gas Journal, July 30, page 121)*.

In March of 1955 Sinclair paid $108 million for American Republics Corp., which had 64 to 70 million barrels of liquid reserves, including gas reserves in terms of their crude equivalent.

The three transactions involved $262½ in cash and oil payments.

Gasoline Plant Going Up

CALGARY.—A central stripper plant and two remote refrigeration units to process solution gas from Fenn, Nevis, and Stettler fields will be put into operation this fall by British American Oil Co., Ltd. The gas is now being flared.

The fractionation plant, designed to handle 20,000,000 cu. ft. of natural gas daily, is being constructed at Nevis. The refrigeration units are going in at Stettler and Fenn fields.

During the remainder of 1956, the Nevis plant will produce an estimated 82,150 bbl. of propane, 38,600 bbl. of butane, and 23,300 bbl. of natural gasoline. By 1960, annual production should reach 453,430 bbl. of propane, 183,430 bbl. of butane, and 123,140 bbl. of natural gasoline.

Few Violations Found

Railroad Commission to end its hearings on exemptions

AUSTIN.—The Texas Railroad Commission probably will discontinue its hearings into the exempt status of oil fields in the state.

Its spring and summer investigation of exemption from shutdown days allowed in 88 fields on the Gulf Coast (District 3) turned up little undeserved allowables.

The commission found that several coastal fields, roughly a dozen, were not entitled to exempt status. But in most of these fields, the wells involved were in the marginal class and therefore could qualify for exemption anyhow.

In only two fields was the agency able to trim allowables substantially by removing the exemption. These were Raccoon Bend in Austin County, and Cedar Point in Chambers County. Raccoon Bend's allowable was chopped by about 1,100 bbl. daily, Cedar Point's roughly by 1,200 bbl. daily.

The biggest percentage of exempt fields in the district are pools on the flanks of salt domes. Most of them were exempt initially for heavy water production or sanding problems. The commission refused to tamper with those fields exempt from shutdown due to the operation of secondary-recovery water-flood programs.

Study likely to end . . . Commission sources say that the meager allowable cuts made via the exhaustive set of hearings for District 3 make it unlikely that similar hearings will be held on exempt fields in the state's other districts.

For one thing, more than a fifth of the state's 430 exempt fields were in District 3. Due to the number and nature of exemptions in this district, the commission felt that the bulk of those unjustified would turn up there.

Sulfur Firm Expands

Manley heads new oil, gas division of Jefferson Lake

TULSA.—Jefferson Lake Sulphur Co., New Orleans, large sulfur producer, has formed an oil and gas division here. Harold W. Manley, Jefferson Lake consultant and special representative, has been named division manager. He formerly was vice president of Barnsdall Oil Co. and later, Sunray Oil Corp.

Jefferson Lake's new unit already has acquired oil and gas leases in Osage County, Oklahoma, has put six wells on production, and has several proven locations scheduled for drilling.

In addition, the new Jefferson oil division will direct operations for the recovery of sulfur from sour gas and will design the new Rotasorber process plants for the recovery of natural gasoline and L.P.G.

The company has two Rotasorbers in a new plant at Bayou Sale, St. Mary Parish, Louisiana. Natural gas is supplied from Bayou Sale wells of Atlantic Refining Co. One Rotasorber uses silica gel as the adsorbent, recovering natural gasoline from the gas stream. Initial test runs are now being made on the second unit, which uses activated charcoal as the adsorbent for L.P.G. recovery.

Jefferson Lake also has agreements with Anchor Gasoline Co., Tulsa, for three additional Rotasorber plants in Louisiana to be jointly owned. Combined gas capacity of the plants will be 200,000,000 cu. ft. per day.

Other operations . . . In Canada's Peace River area Jefferson Lake plans a 100,000-ton sulfur-extraction plant.

The plant, near Fort St. John, B. C., will be built by Ralph M. Parsons Co. It is to be completed in October 1957 and will be operated by Jefferson Lake Sulphur Co. of Canada, Ltd.

It will process concentrated hydrogen sulfide gas bought from Pacific Petroleums, Ltd.

Jefferson Lake now has extended its stock ownership in Merichem Co. to 94 per cent and is completing arrangements to absorb the company. Merichem will become Jefferson Lake's petrochemical division. Expansion during the next 12 months is planned in order to double production of cresylic acid.

Jefferson's research and development division soon will put into operation the first "turbine-submerged burner unit," which will use oil or gas to heat water for use in producing sulfur by the Frasch process. The firm is negotiating for Gulf Coast properties which have commercial sulfur possibilities.

Cuban Well Falls Off

Completion rate lower than expected from island's most promising strike; offset is nearing producing formation

CUBAN AMERICAN DRILLING & EXPLORATION CO.'S 1 Catalina, deep discovery which fired Cuba's oil fever to a new high pitch in early July, has been completed for a disappointingly low 30 bbl. a day.

The well, located roughly 4½ miles southwest of Jatibonico field in Cuba's central basin, is flowing 35°-gravity oil from a limestone zone through perforations at 7,107-20 ft.

The oil is being trucked to a 1,000-bbl. daily refinery at Cabaiguan, about 20 miles west of Sancti Spiritus.

Cuban American officials told the Journal last week that the company would await results of an offset well now being drilled by Cuban Canadian Petroleum Co. a half mile to the north before spotting any of its own confirmation locations.

The Cuban Canadian well last week was drilling below 5,300 ft. Cuban Canadian is a subsidiary of American Leduc Petroleums, Ltd., and one of the operators in Jatibonico field.

Below expectations . . . The 30-bbl. completion rate for the 1 Catalina was well under what was generally expected as a result of the promising drill-stem test run early in July.

Production string of casing was run and perforated soon after this test and the well has been treated and tested for the past month. Efforts to obtain steady flowing production by a 1,000-gal. treatment with mud acid then a 4,600-gal. shot of hydrochloric acid proved fruitless.

The well has continued to flow by heads through ½-in. choke, with pressure building up to as high as 250 psi, then falling off completely. Operator has been puzzled by gas production in greater quantity than might be expected from pressure readings.

The company finally completed the well using an intermitter. It decided against installing a pump, fearing the well might gas-lock.

New attempt . . . The company meanwhile was preparing to spud in its third well in the Cristales area 9 miles east of Jatibonico field and 12 miles northeast of the 1 Catalina.

The 1 Cristales, its first try in the area, developed a flow of gas estimated initially at 5,000,000 cu. ft. daily from 2,708 to 2,738 ft. It was later abandoned, however, due to water encroachment.

The 1A Cristales, a 1,000-ft. offset, is now awaiting orders after checking the same zone and finding only a slight, noncommercial show of oil. The 1A, found to be lower on the structure than the first test, also encountered an oil show at the 2,000-ft. level not picked up in the No. 1.

The company will drill the 2 Cristales a mile east and slightly north of the 1A.

During the drilling of this well, Cuban American will complete its contract to drill 40,000 ft. of hole on its 1,000,000 acres of concessions.

The company acquired the bulk of the acreage from Trans Cuba Oil Co. and Cuban Venezuelan Oil Voting Trust and has a 50 per cent interest in any production it finds.

It has only about 2,200 ft. to go on the footage commitment. When this point is reached, Trans Cuba and the Voting Trust must pay half of all further exploration and development expenses. Cuban American will continue to serve as operator of the joint venture.

The 1A Cristales was Cuban American's seventh hole drilled in Cuba under the Trans Cuba-Voting Trust agreement since it entered the country 2 years ago. Only one, the 1 Catalina, is a producer.

Russian Output Up

Production first 6 months was 1,590,000 bbl. daily

RUSSIA has reported new gains in oil and gas production.

The U.S.S.R.'s Central Statistical Administration says that petroleum output during the first half of 1956 totaled 39.7 million metric tons (1,590,000 bbl. daily)—up 19 per cent over the same period last year. Gas production increased 27 per cent to 226 billion cubic feet.

Refinery production exceeded goals set for the first 6 months of the sixth Five-Year Plan (1956-1960). Over-all, the U.S.S.R. Ministry of the Oil Industry said it achieved 101 per cent of plan for the period.

Below goals . . . However, the Statistical Administration cited these shortcomings:

"Goals for increasing the speed of operational and exploratory drilling and for obtaining more light petroleum products from crude were not met, although some gains were shown.

"The Oil Ministry failed to fulfill its plans for introducing progressive technological processes into the industry and fell short of objectives in mechanizing drilling and extraction operations.

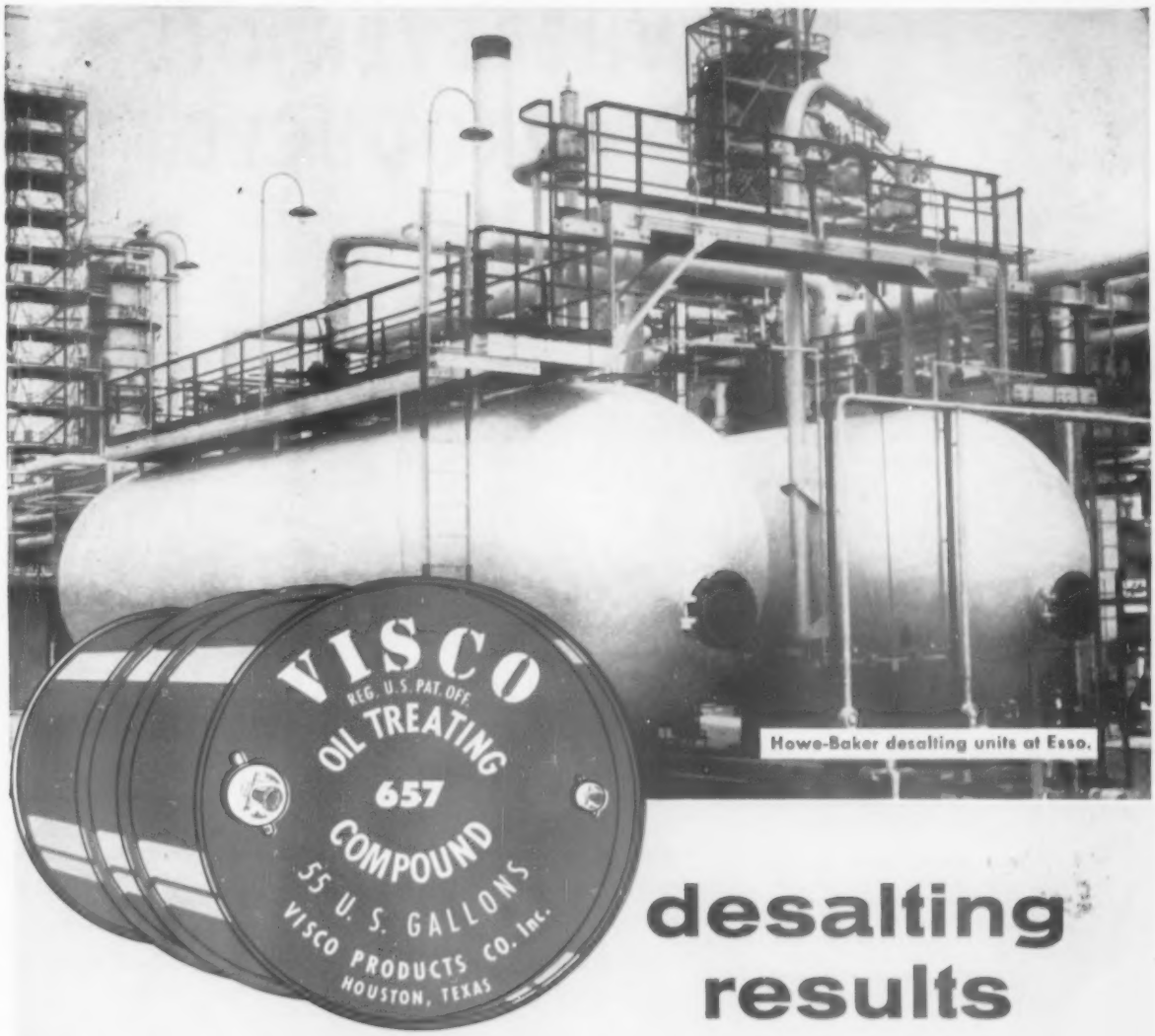
"The Ministry for Oil Industry Construction did building work totaling 2,495,000,000 rubles ($623,750,000) during the first half of 1956—15 per cent more than in the same 1955 period but only 91 per cent of plan."

Wildcat Staked in Turkey

American Overseas Petroleum, Ltd., a Caltex affiliate, has staked location for its first wildcat in Turkey.

Amoseas disclosed last week that 2,000 tons of equipment, including a heavy drilling rig, will be shipped from the United States to Turkey this month. The company's first deep test will be drilled by Brown Drilling Co., Long Beach, Calif., 18.6 miles from Gaziantep in southern Turkey near the end of this year. Amoseas has eight exploration licenses in southern Turkey and seven more in Thrace. The over-all total is 718,607 hectares (about 1,750,000 acres).

Amoseas is the second American company to announce plans for a drilling operation in southern Turkey in the near future. Gilliland Oil Co., Los Angeles, plans to drill its first test on the Gulf of Iskenderun next month.



Howe-Baker desalting units at Esso.

desalting results

. . . a foregone conclusion at Esso's Bayway Refinery

The modern equipment shown above is one of the recent additions to the Esso Standard Oil Company Refinery at Linden, New Jersey.

With equipment such as this, plus the familiar blue barrels of Visco, outstanding desalting results are a foregone conclusion.

Visco, in either electrical or salt settling equipment, still provides the consistently efficient — and economical — chemical solution to the problem of greater throughput and lower corrosion costs.

Specific information on your particular desalting needs is readily available through your Visco Representative, or contact Visco direct.

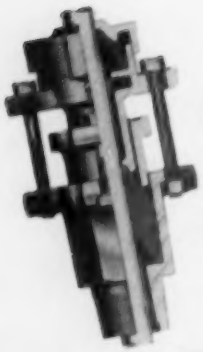
VISCO PRODUCTS COMPANY
INCORPORATED
2600 Nottingham at Kirby Houston 5, Texas
Telephone: MAdison 3-0433

Visco® CONSISTENTLY EFFICIENT OIL INDUSTRY CHEMICALS

WHEREVER OIL IS PRODUCED

You'll Find

HERCULES PRODUCTS



"REGULAR TYPE" DUPLEX POLISHED ROD STUFFING BOX

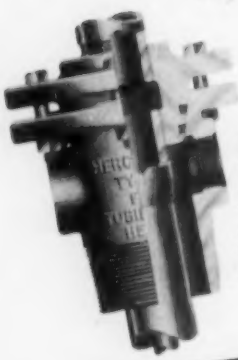
The old reliable. Tried and proved on thousands of wells at home and abroad.

"TEE BASE TYPE" DUPLEX POLISHED ROD STUFFING BOX

A combination Stuffing Box and Pumping Tee. Makes a short connection. Bolt lugs are placed low to eliminate fouling of elevator links. No bell nipple needed as top of body will support elevator. Full opening — unnecessary to remove body when pulling or running rods.

"TYPE DP" DUPLEX POLISHED ROD STUFFING BOX

Double Packed Stuffing Box for use on high pressure wells and those that flow intermittently. Especially desirable for wells located near buildings, fire hazards or growing crops. Two compression bolts in bottom sections are tightened on Cone Rings to pack-off while replacing packing in upper section.



"TYPE F" TUBING HEAD

Made of pressure cast steel. Supports tubing by means of a flanged mandrel. Pack-off is accomplished by two "O" rings. Two inch side outlets.

HERCULES Products have gone far. Outside the U. S. A. you will find them in Canada, Venezuela, Iraq, Saudi Arabia, Indonesia and Borneo. Wherever you find them you are assured of the same quality, safety and economy. If you produce oil, anywhere, you should know about HERCULES Products. A cablegram, telephone call or letter from you will bring a reply with complete information.

HERCULES CROSS TEES and UPSET PUMPING and FLOWING TEES

A complete line to fit all tubing sizes normally used. Special sizes "custom made" to order.

"TYPE RC" TUBING HEAD

Designed especially for use with Reda Pumps. Hercules overhead packing is used, permitting tubing and electric cable to be packed-off simultaneously.

AVAILABLE THROUGH ALL SUPPLY STORES

Export Representative
OIL FIELD EQUIPMENT CO., INC.
30 CHURCH STREET
NEW YORK 7, NEW YORK
Cable Address: HERTOCO

HERCULES TOOL Company
MANUFACTURERS OF OIL FIELD EQUIPMENT SINCE 1924
GENERAL OFFICES AND PLANT TULSA, OKLAHOMA
Export Representative: Oil Field Equipment Co., Inc., 30 Church Street, New York 7, N. Y.

Panama Test Planned

International Oil & Metals to test 10,000,000-acre concession in Darien Province of southeastern area

PANAMA jumped back into the oil news spotlight last week with the announcement that International Oil & Metals Corp., Seattle, Wash., is getting ready to spud in a wildcat in central Darien Province in southeastern Panama.

International Oil & Metals, a combination of mining interests in the Pacific Northwest, has acquired a 75 per cent interest in a 10,000,000-acre concession held by Cia. Petrolera del Golfo del Darien. International will be the operator.

The Petrolera firm was formed 2 years ago when it acquired the acreage from the Panamanian Government. The concession is in southeastern Panama adjoining Colombia and covering a part of the Gulf of Darien. Petrolera has done extensive surface geological work and mapping of the area, but no drilling. It is an affiliate of World Commerce Corp., New York.

The drilling operation announced last week by J. B. Haffner, president of International Oil & Metals, is the second for Panama in 2 months. Both will be carried out by companies new to the oil industry. International has some oil and gas interests in Montana, but they are small.

In June, the Panamanian Government granted a 2,240,000-acre concession to Consolidated American Industries, Inc., a diversified company entering the oil business for the first time. Consolidated American plans to start a well about November 1 near San Blas on the Caribbean Coast about halfway up the isthmus from the Petrolera acreage *(The Oil and Gas Journal, June 18, page 148)*.

There are also persistent industry rumors that Union Oil Co. will drill a test on Panama acreage across the border from its Costa Rican drilling operation. Union Oil's subsidiary, Cia. Petrolera de Costa Rica, is drilling its second well at Cocoles after encountering oil shows in the first well which it has called "not too encouraging" *(The Oil and Gas Journal, July 9, page 74)*.

Panama's past . . . The two new independent companies entering Panama, and presumably Union also, will be working over territory explored by three major companies and then abandoned as disappointing.

The exploration programs will be Panama's first since 1949 when Sinclair Panama Oil Corp pulled out of the country after 3 years of exploratory work and two dry holes. Sinclair Panama was owned by Venezuelan Petroleum Co. (Sinclair) and Cities Service Co.

The company's first test on Colon Island off Bocas del Toro was abandoned between 8,000 and 9,000 ft. The second was drilled on the Pacific side of the isthmus near Puerto Armuelles in the Province of Cherique near the Costa Rican border. It was abandoned in basement at 9,715 ft.

Sinclair, Cities Service, and Gulf Oil Corp. all had drilling operations in Panama 20 years earlier than this.

Gulf was the only one to turn up what might be called even a good show. Its well at Garachine about 120 miles southeast of Panama City near the Pacific Coast was never a commercial producer. Sinclair found some gas in wells on Columbus Island off the Atlantic Coast. Cities Service drilled three dry holes in the Darien area about 1928. The deepest was about 3,500 ft.

Panama's refining picture . . . Along with the renewed interest in exploration in Panama are two major projects to build refineries in the country with a combined capacity of 125,000 bbl. daily *(The Oil and Gas Journal, June 11, page 100)*.

John M. Shaheen, New York investor who heads Panama Refining & Petrochemical Co., Inc., expects the company's 55,000-bbl. refinery to be under way in the near future. Contracts are due for letting almost immediately.

D. K. Ludwig, president of the shipping firm, National Bulk Carriers, Inc., and sole owner of Panama Refining, Inc., has revealed only that his firm's refinery will have a 70,000-bbl. daily throughput. Both plans were authorized by the Panamanian Government last May.

Colombia Play Pushed

Government wants exploration speedup; tells companies to sign concession contracts or step aside for other firms

COLOMBIA appears headed for stepped-up exploration play, sparked by a government move calling on companies to either sign concession contracts on vast areas held under application or make way for the entry of new firms.

The government wants more exploration work done, and it wants it started soon. Companies were told to convert applications to concessions by August 31 on millions of acres or yield the acreage to the government.

Colombia says a number of smaller companies and independents are waiting on the doorstep. But most of the prime basin areas already are covered by major operators. An application, in effect, gives a company an option to acquire a concession later.

Fast growing consumption within the country also is creating pressure for higher crude output.

Colombia, a neighbor of Venezuela, is the second ranking producer in South America. Output, however, has been comparatively stationary. Production is now around 118,000 bbl. daily, only a few thousand barrels daily more than 5 years ago.

The government says that of 40,000,000 acres involved, only about 7,500,000 acres, or less than one-fifth, is actually under concession or exploitation.

Intercol has top stake . . . International Petroleum (Colombia), Ltd., a subsidiary of Standard Oil Co. (N. J.) holds the most acreage under application.

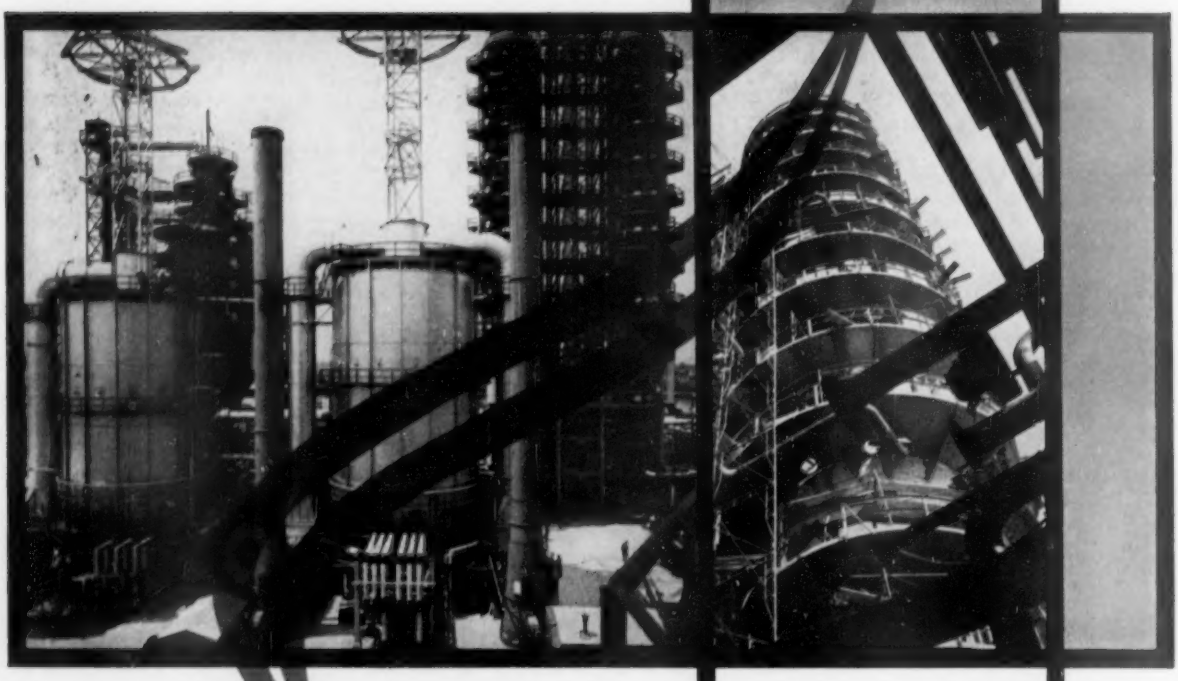
Last week Intercol had signed contracts covering 8 out of 34 applications for a total of about 1,000,000 acres out of 22,500,000 acres it held alone. The other 26 are still with the government awaiting processing. The company has 50 per cent interest in joint applications with Mobil Oil de Colombia, covering 2,046,462 acres.

The company had 1,650,000 acres under concession or exploitation agreements. It has budgeted about $12,000,000 for exploration in the country this year.

Socony's land position in Colombia early this month consisted of a net interest in concessions covering 682,000 acres. About 250,000 of this is held jointly with Intercol.

At the same time, Socony's Colombian subsidiary had an interest in 52 applications at various stages of government consideration. Of these, 34 were in Mobil's own name, but this

PARSONS



SINCLAIR REFINING COMPANY'S New Distillation Units By PARSONS

One of the largest installations of petroleum distillation capacity is now on stream at the Sinclair Refinery in Marcus Hook, Pennsylvania.

Daily capacity of the crude units is almost 150,000 barrels and that of the vacuum column is 38,000 barrels.

Design, procurement, and construction are by PARSONS.

THE RALPH M. PARSONS COMPANY

NEW YORK
PASADENA
WASHINGTON

ENGINEERS • CONSTRUCTORS
LOS ANGELES

ANKARA
BAGHDAD
BEIRUT
JEDDAH
KARACHI
NEW DELHI
PARIS

does not necessarily represent 100 per cent ownership. Thirteen of these are believed to be ready for contracts.

The gross acreage involved in the 52 applications is more than 6,500,000 acres, but much of it is in a joint development program with other companies. Mobil's net interest in the total is 4,322,000 acres.

The Texas Co., which is the leading producer, has converted all applications except one. The company already had 1,276,791 acres in concessions. It holds another 434,800 acres in fee.

Royal Dutch-Shell had six options pending and was still studying the matter.

Goal is long range . . . The government's action, made under the provisions of the 1953 petroleum code, was tempered by economic realities.

The action came on acreage mostly in western Colombia, an area which seems more likely to attract newcomers.

In the eastern llanos, where exploration costs would be almost prohibitive to a smaller company or independent, companies were not required to decide on acreage except in the case of one or two contracts. From 10,000,000 to 12,000,000 acres are held under application in the region.

The petroleum code requires companies to sign contracts on applications within 90 days. Notice of the deadline was given on June 1.

Colombia's enforcement of the rule will not necessarily mean wholesale exploration programs within the near future.

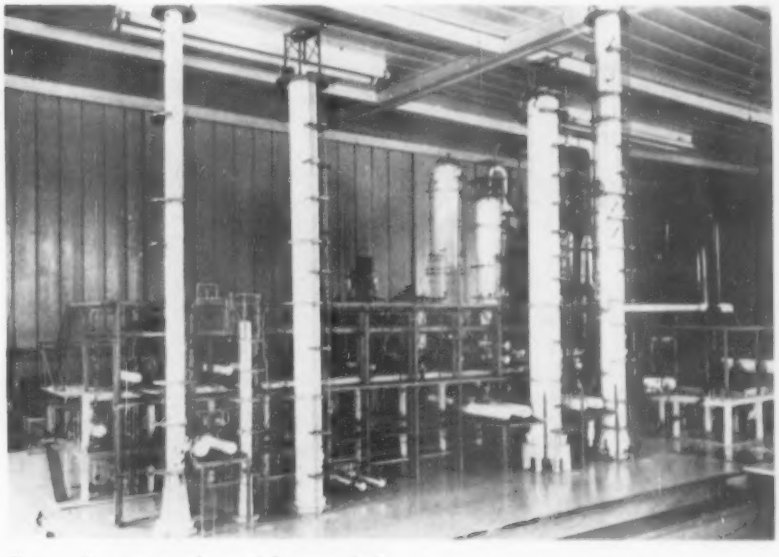
Companies can take up to 4½ years before starting to drill on concessions. But once drilling is started, a rig must be kept going. After 5 years, four 1-year extensions can be obtained.

Colombia has looked to new companies several times in recent months as a means of building its oil industry. Exploration, drilling, or secondary-recovery agreements have been signed with Cities Service Co., John W. Mecom, and Forest Oil Corp. *(The Oil and Gas Journal, December 12, 1955, p. 138; May 14, 1956, p. 121).*

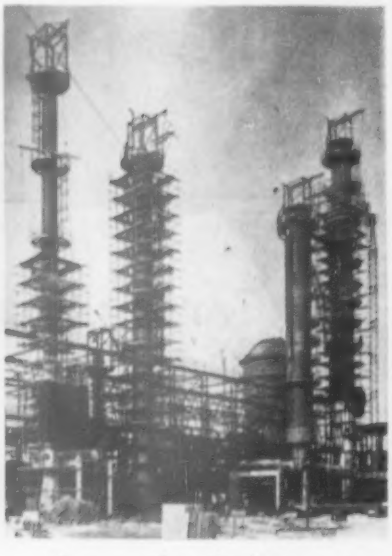
Venezuela bidding continues . . . Colombia's decision to make room for new companies at the present time may in part be due to heavy spending for new concessions in Venezuela.

Latest reports from Caracas are that two newcomers were among the successful bidders on the second offering of six tracts of national reserve acreage in Lake Maracaibo. Superior Oil Co. is believed to have won a tract of 3,146 hectares, and Venezuelan Leaseholds, C.A., a 797-hectare piece of the northwest of Lot V-575.

Royal Dutch-Shell was said to have obtained 4,122 hectares in northwest Lot V-574; and Mene Grande, 4,041 hectares in Lot V-576, and 4,329 hectares in Lot V-575. Venezuelan American Independent Oil Producers Association was credited with getting Lot V-574.



From large-scale table model . . .



To completed plant . . .

"Three-Dimensional" Blueprint Saves Money

BEFORE a dime was spent for the new integrated catalytic cracking plant at the Pernis refinery of N.V. de Bataafsche Petroleum Mij. near Rotterdam, engineers for the Royal Dutch-Shell company spent about $18,200 on scale models of the units.

This "three-dimensional" blueprint worked out so successfully the company figures it saved a great deal of money in spite of the model's initial cost. The company hasn't divulged just how much it saved, but it likes the idea so well that models are now being built for future units at the refineries at Cardon, Venezuela, and Curacao.

Built of wood, plastic, and copper to a 1:50 scale, the model is actually in three parts: the cat cracker itself, two vacuum distillation units, and the gas recovery plant shown in the pictures. The three models were mounted on separate tables and could be placed together for a study of the entire unit.

Royal Dutch-Shell says the table models enabled its engineers to solve many construction problems before the actual building began, particularly with regard to pipelines. The models were used by contractors before construction bids were submitted. The refining company says because of the model study, contractors' bids were reduced from 10 to 20 per cent.

When added to the 200,000-bbl. Pernis refinery, already Europe's largest, the new integrated unit will bring the refinery's total cat-cracking capacity to about 65,000 bbl. daily.

UNIVERSE LEADER, world's biggest tanker, leaves drydocks at Kure as . . .

New Tanker Champion Crowned

THE 94,730-ton Universe Leader this month slid down the ways at Japan's Kure shipyards to set a new record as the world's largest tanker.

Bigger by nearly 12,000 tons than the biggest battleship ever built, the argonaut will operate under Liberian registry for American-controlled Universe Tank Ships. After completion, scheduled for October, it will make the Middle East-North American run.

The tanker cost more than 10 million dollars and took 300,000 man-days of labor to build. It was constructed by National Bulk Carriers, Inc., of New York, which owns Universe Tank Ships.

National Bulk has Kure Shipyards, Inc., under lease. It was in these yards that Japan built its 72,800-ton Yamato, world's biggest battleship, which was sunk during World War II.

Here's how Universe Leader measures up to the Queen Elizabeth. The tanker is shorter, 800-plus feet to 1,031, but it's heavier by more than 1,000 tons and is 6 ft. wider at the beam.

The mammoth tanker will carry 707,000 bbl. of crude, more than the state of Oklahoma's daily production, at a speed of 14.5 knots *(The Oil and Ga Journal, August 13, page 88).*

The ship snatched the tanker circuit's heavyweight title from Tidewater Oil Co.'s 52,680-ton George F. Getty, champion of less than 3 months.

But Universe Leader itself is due to bow out of the winner's circle in the near future. A sister ship and two 87,200-tonners are on the ways at Kure and at least one tanker of the 100,000-ton class has been announced. A. S. Onassis is scheduled to build it in America.

Burning Aramco Well Killed

An unusual oil-well fire in Saudi Arabia has been snuffed out after raging for nearly 2 weeks.

Myron Kinley, Houston firefighter, succeeded in attaching a valved pipe to the well head and killing the well with mud. Arabian American Oil Co. officials said they do not know how the fire started. The well was an old producer drilled in 1939. It is west of Jubail and about 37 miles from Abu Hadriyah camp.

A pilot noticed the blaze from the air. Kinley was summoned, and until his arrival Aramco workers sprayed water on the christmas tree to minimize damage.

It was Aramco's third fire. The 12 Damman caught fire in 1939 and the 20 Ain Dar in 1951.

Iran's Oil For Sale

Offering of royalty crude indicates output to climb

NATIONAL IRANIAN OIL CO. is offering for sale during 1957 a total of 27,518,000 bbl. of Iranian light crude oil. This represents 3,660,000 long tons and is offered in quarterly quantities f.o.b. at Bandar Mashur.

The oil apparently represents the Iranian Government's one-eighth royalty from production in Iranian fields operated by the Consortium Group of international oil companies. Iran may take the royalty in crude or cash at a fixed price per barrel.

The offering amounts to 75,390 bbl. daily and indicates the government expects next year's production to increase to more than 600,000 bbl. daily. Production for May, the latest month for which statistics are available, totaled 560,000 bbl. daily *(The Oil and Gas Journal, August 6, page 70).*

Offerings by quarters are 6,683,000 first quarter; 6,840,000 second; 6,919,000 third; and 7,076,000 fourth. Characteristics of the crude are 34.39° gravity, 1.3-1.4 per cent sulfur; and 6.5 to 8 lb. vapor pressure at 100° F., with salt content of 2.5 lb. per 1,000 bbl.

The Iranian embassy in Washington, which publicized the offerings, said deadline for bids is September 30. Bidders will be notified before November 30 of acceptance or rejection.

Gulf Denies Bolivian Report

Gulf Oil Corp. flatly denies it has offered to build a pipeline from Bolivian fields to Sao Paulo, Brazil, in return for permission to build two refineries. The line would be from 1,000 to 1,200 miles long.

The denial followed reports from Brazil last week that the Joint Brazil-Bolivia Development Commission was considering such an offer.

Brazilian law now gives the government a monopoly over refining. New legislation would be necessary before any refining concessions could be made to a private company.

CANADA

WHERE OIL IS KING . . .

EXPLORATION AND DRILLING in Canada—At an all-time peak. Currently 304 rigs are running in four western provinces, operated by 65 separate firms. In the first half of 1956, footage drilled was 6,329,699 ft., a new record; this represents 1,290 new completions. Of these, 990 were development, 300 wildcat, with success ratios running 75 per cent for development, 25 per cent for wildcat. Land under lease—165 million acres.

PRODUCTION zooming steadily, now 415,000 bbl. daily. Prediction: 550,000 by 1960, 1 million in 1970. About 9,000 oil wells now can produce, plus 1,000 capped gassers. Cumulative production for four provinces: 621,451,928 bbl.

NATURAL GAS is one of Canada's greatest untapped natural resources. Outlets now planned and building will open to North American markets 20.5 trillion cubic feet. Its whoosh will set off unparalleled development drilling programs.

RESERVES of liquids now estimated 2.92 billion barrels—expected to reach 10.8 billion by 1980. Natural-gas reserve, now at 20.8 trillion cubic feet, expected to reach 55 trillion by 1970.

PIPELINES today's news in Canada. Greatest is Trans-Canada gas line, now snaking 2,250 miles Alberta to Ontario; complementary trunkline system to blanket Alberta. Another great gas line pushes toward Pacific Northwest from northern British Columbia. Four important crude lines now building to tap bottled-up fields. Total projects represent ultimate outlay of $595 million over next 2 years.

REFINING AND PETROCHEMICALS race ahead. Capacity now more than 750,000 bbl. daily. Construction and growth show no abating. Petrochemicals loom large. Synthetic rubber, fabrics, plastics, paints, sulfur, propane, butane, and host of other products will mold an industrial future from one coast to the other.

THE ARTICLES in this special section are contributed by outstanding Canadian oil men. Canada is a modern laboratory of oil. Operators there have evolved new theories, new methods, new ideas, new equipment. Here is told the story of that progress.

CANADIAN TECH REPORT. On the next seven pages, previously unpublished field data provide a valuable technical reference. The foldout map is graphic evidence of the success of Canadian oil finders.

A COPYRIGHTED JOURNAL TECH-REPORT

A JOURNAL TECH-REPORT

FUNDAMENTAL OIL AND

Field	Discov. Date	Location Twp. & Rge.	Produc. Name	Av. Depth	Struct.	Area Ac.	Reservoir Characteristics: % Por.	Perm.	Thick.	Drive	No. Wells*	Ult. Rec. Mill. Bbl.	Cum. Rec. Thous. Bbl.	Gravity A.P.I.	% Depletion
Alberta															
Acheson Fields:															
North L.C.	1952	53-26w4	L. Cret.	4,100	Struc.	160	21.5	650	9	Water-gas	2	1.7		37	0.7
West L.C.	1954	.....	L. Cret.	4,100	Struc.	240	17.5		11	Water-gas	3	0.5		37	4.5
South L.C.	1954	.....	L. Cret.	4,100	Struc.	160	17.5	140	16	Water-gas	1-2	0.5		36-38	1.0
Other L.C.	1950	.....	L. Cret.	4,100	Struc.	400					3-5	0.05	11,912	37	47.4
North D2	1952	.....	Dev. D2	4,550	Reef	720	2.4	200	42	Water-gas	8-9	1.5		38-40	14.7
Other D2	1952	.....	Dev. D2	4,550	Reef	80					0-1				
D3	1950	.....	Dev. D3	5,250	Reef	7,000	9.1	3,600	81	Water-gas	88	65.8		37-38	7.8
Acheson, East	1953	53-25w4	L. Cret.	4,100	Strat.	400	18.0	445	15	Water-gas	4-5	0.6	136.2	37	3.9
Alder Flate	1955	45-9w5	Card.	5,600	Strat.	160	15.0	15	30	Sol. gas	0-1		2.6	41	
Alex. Ind. Res.	1954	56-27w4	L. Cret.	4,100	Struc.	1,000			20		6	35 Bill.	0	Gas	
Alhambra	1954	42-6w5	Card.	6,350	Strat.	21,000	14.5	10	7	Sol. gas	9-10	28.7	70.5	42	0.17
			Belly River	4,200	Strat.	40					1		0.22	37	
Alliance	1951	40-13w4	Viking	3,300	Strat.	400	22.0	180	18	Water	0-5	0.2	69.6	25	0.7
Armisie	1951	52-25w4	L. Cret.	3,300	Struc.	640	18.2	155	23	Water	3-8	0.2	293.7	38	2.2
Athabasca	1943	66-23w4	L. Cret.	1,700	Strat.	520			20		2-3	7 Bill.	633.6 Bill.	Gas	
			Dev. D1									5 Bill.			
Atim	1953	54-26w4	Viking	3,200	.....	160			15	.....	0-1		353 M.	Gas	
Badger Lake	1954	17-18w4	Miss.	4,000	Struc.	80			40	.....	0-1		0	26	
Barons	1950	12-23w4	L. Cret.	4,100	Strat.	500	18.5	625	4		6	0.6	196.3	33	16.5
Bashaw	1951	41-22w4	Dev. D3	5,650	Reef	400	5.7	800	9	Water	4-5	0.4	204.8	41	10.8
Battle	1953	46-20w4	Viking	3,350	Strat.	1,000	12.5	260	13.5	Water	11-13	0.8	335.8	36.5	10.6
Battle, South	1954	45-20w4	Viking	3,300	Strat.	1,100	14.2	240	16	Water	10-14	2.5	217.9	36.8	4.1
Baxter Lake	1951	47-5w4	L. Cret.	2,200	Strat.	640			10		3-8	2.5	133.5	16.6	1.0
Belloy	1951	78-1w6	L. Cret.	3,000	Strat.	160			13		0-2	60 Bill.	6.2 M.	Gas	
			Miss.	4,400		160			16			15 Bill.		Gas	
Bentley	1955	40-1w5	Viking	6,000	Strat.	1,000	12.0	400	15	Sol. gas	0-9	3-7		35	
Bindloss	1955	22-4w4	Viking	2,200	Strat.	1,200			25	.....		55 Bill.		Gas	
		22-4w4	Blairmore	2,400					20		0-7	30 Bill.		Gas	
Black Butte	1944	1-8w4	L. Cret.	3,170	Anticl.	320			20		1-1	19 Bill.		Gas	
		.....	Jurassic	3,200		500					1-2	13 Bill.	7.5 Bill.	Gas	
		.....	Miss.	3,300							0	10 Bill.		Gas	
Blue Ridge	1954	58-8w5	Dev. D2	7,200	Reef	320				Water	2		1.5	37	
Bonnie Glen	1952	47-27w4	Dev. D3	6,900	Reef	7,000	9.7	800	22.8	Water	143-147	300 (plus 640 Bill.)	24,310	41-43	4.2
Bonnyville	1951	60-5w4	Blairmore	1,200	Struc.	3,500			10	Sol. gas	8-22 (oil) 2-4 (gas)	4 Bill.	164.7 605 M.	14	
Bow Island	1909	11-11w4	L. Cret.	2,100	Anticl.	2,000					1-15	16 Bill.	40 Mill.	Gas	
Braeburn	1954	77-10w6	L. Cret.	(?)	(?)	160						6 Bill.	0	Gas	
		.....	Triassic	(?)							0-1	6 Bill.	0	Gas	
			Per. Penn.	7,250								40 Bill.	0	Gas	
Brooks	1910	18-14w4	L. Cret.	1,350	Strat.	2,500			10		7-8	93.5 Bill.	2.7 Mill.	Gas	
Burnt River	1955	76-10w6	L. Cret.	3,800	(?)	320			30	.....	0-1	.....	0	Gas	
Campbell	1949	54-25w4	Blairmore	3,700	Strat.	2,300	17.9	90	13	Gas	7-14	2.2	315.9	29	2.8
Campbell Creek	1955	68-7w6	L. Cret.	6,150	(?)	160			32	.....	0-1		0	Gas	
Carbon	1955	29-22w4	L. Cret.	4,800	(?)	160			34	.....	0-1		0	Gas	
Cessford	1950	25-13w4	Viking	2,800	Strat.	2,800	22.0	120	14	Gas	19-35	7		26	2.3
	1952	.....	B. Colo.	2,940		2,250	25.0	500	9	Water	19-28 (	1 trill.)	65.8	26	
	1953	.....	B. Cret.	3,300		560	20.0	300	7.5		0-7	0.5		26-27	0.09
Chamberlain	1952	52-23w4	L. Cret.	3,700	(?)	240	15.0	550	14	Water	0-3	1.3	82.3	26	1.6
Chauvin	1952	43-1w4	L. Cret.	1,950	Struc.	2,240	27.7	145	10.7		25-28	4.2	459.3	23	3.5
Chauvin, South	1952	42-2w4	L. Cret.	1,950	Struc.	500	23.0	130	10.5		0-6	0.12	29.4	20-23	3.5
Clear Hills	1955	88-2w6	Gran. W.	6,900	Strat.	80			50	(?)	1		30	39	
Clive	1951	40-24w4	Dev. D2	6,250	Reef	500	5.2	300	15.2	Comb.	3-6	3.8		39	3.6
	1952	.....	Dev. D3	6,350	Reef	1,000	5.2	1,400	22	Comb.	12	5.4	719.8	40	9.0
Cold Lake	1953	63-3w4	L. Cret.	1,000	Struc.	640			10		3-4		840 Mill.	Gas	
Compeer	1955	33-9w4	Miss.	2,750	(?)	80			30	(?)	1		1	16	
Congdon	1955	42-16w4	L. Cret.	3,440	Strat.	160			33	.....	0-1		0	Gas	
Conrad	1944	6-15w4	Jurassic	3,100	Strat.	1,200			10		15		1,671	26	
Cooking Lake	1955	51-22w4	Viking	3,300	(?)	160			10	.....	0-1		0	Gas	
Countess	1951	21-16w4	Bow Is.	2,900	Anticl.	500			30		0-3	60 Bill.	0	Gas	
Cynthia	1955	49-10w5	Cardium	5,600	Strat.	400	14.0	15	30	Sol. gas	0-5	1	0	37	
Del Bonita	1947	1-22w4	Miss.	5,200	Nose	1,000	3.0		15		10-12		254.9	36-37	
Dina	1929	45-1w4	L. Cret.	1,800	Struc.	250			10	Sol. gas	0-3	0.2	142.9	10-13	
Dixonville	1952	86-1w6	L. Cret.	2,400	Fault	320			35		0-2	27 Bill.	0	Gas	
Drumheller	1950	29-19w4	L. Cret.	4,450	Strat.	320			40	Sol. gas	0-4		752.1	31.5	
		.....	Dev. D2	5,250	Reef	1,050	8.2	700	20	Water	11-13	5.2	351.4	34	19.1
Drumheller, W.	1952	29-21w4	Dev. D2	5,250	Reef	3,400	5.0	290	46	Water	66-67	14.3		42	6.3

*First figure is number producing; second figure is number capable of producing.

GAS FIELD AND RESERVOIR DATA

Field	Discov. Date	Location Twp.& Rge.	Produc. Name	Av. Depth	Struct.	Area Ac.	Reservoir Characteristics				No. Wells*	Ult. Rec. Mill. Bbl.	Cum. Rec. Thous. Bbl.	Gravity A.P.I.	% Depletion
							% Por.	Perm.	Thick.	Drive					
			Dev. D3	5,700	Reef	1,000	8.4	700	19.3	Water	12	2.5	3,290.5	37	4.3
Duchess	1951	20-15w4	L. Cret.	3,120	Strat.	320			20		0-2	5 Bill.	0	Gas	
Duhamel	1950	45-21w4	Dev. D2	4,500	Reef	1,200	5.7	300	34	Water	11-15	5.5		36.6	7.7
			Dev. D3	4,900	Reef	1,040	7.6	300	54	Water	13	5.5	2,429.3	34-36	11.2
Dunvegan	1952	81-4w6	L. Cret.	1,450	Struc.	160			30		0-1	6 Bill.	0	Gas	
Duvernay	1949	60-11w4	L. Cret.	2,000	Strat.				20		1-4		680 Mill.	Gas	
Eaglesham	1952	77-26w5	L. Cret.	1,800	Struc.	160					0-1	1 Bill.	0	Gas	
			Miss.	4,400	Struc.	160			26		0-1	7 Bill.	0	Gas	
Elk Point	1946	56-5w4	L. Cret.	1,400	Strat.	500			8		2-3		333 Mill.	Gas	
Ellerslie	1950	51-20w4	L. Cret.	4,100	Struc.	500	22.7	945	8	Water	4-6	0.4	201.7	29-30	11.0
Erskine	1952	39-21w4	Dev. D3	5,250	Reef	3,000	6.3	800	25	Comb.	57-60	8.0	1,089	28	3.1
Ewing Lake	1953	37-21w4	Dev. D2	5,340	Reef	250	3.6	300	29	Comb.	3			31	5.9
			Dev. D3	5,510	Reef	160	3.1	400	11	Comb.	1	1.5	54.1	30	56.5
Excelsior	1949	56-24w4	L. Cret.	3,000	Struc.	80				Water	0-1		3.5	23.7	
			Dev. D2	4,100	Reef	2,640	5.5	500	79	Water	33	16.9	5,591	35.8	15.4
Eyremore	1955	18-18w4	Bow Is.	3,300	(?)	160			43		0-1		0	Gas	
Fairydell-Bon Accord	1949	56-23w4	Dev. D2	3,700	Reef	500	6.9	444	20-29	Water	12-17	10.0		26-35	5.0
			Dev. D3	4,100	Reef	1,000	6.6	850	47	Water	18-19	10.0	1,371	26	3.6
	1953	57-24w4	Viking	3,700	Strat.	800			10		0-5	98 Bill.	1.9 Bill.	Gas	
Fenn-Big Valley	1950	35-20w4	Dev. D2	5,250	Reef	15,000	8.6	1,490	5.1	Water	292-297	129.0		28-33	4.9
			Dev. D3	5,400	Reef	1,800	9.7	2,330	12-20	Water	23	5.0	21,129	24-32	20.0
Ferrier	1955	39-8w5	Viking	8,300	Strat.	4,600	13.0		15	Sol. gas	3	9.3	60	41	
Ferrybank	1955	44-27w4	Dev. Gr. Sh.	7,100	Strat.	80			37	(?)	0-1		0	36	
Foremost	1923	6-11w4	Bow Is.	2,200	Strat.	1,000			6		0-5	21 Bill.	5 Bill.	Gas	
Fort Saskatchewan	1951	53-21w4	Viking	2,400	Struc.	2,500			16		5-14	130 Bill.	11 Bill.	Gas	
Garrington	1954	35-4w5	Cardium	6,900	Strat.	320	15.0	15	14	Sol. gas	0-2	0.10	14.9	41	
Ghost Pine Crk.	1955	31-22w4	L. Cret.	4,800	Struc.	160			15		0-1	10 Bill.	0	Gas	
			L. Cret.	4,850		80			15		0-1		0	35	
Gilby	1955	41-2w5	Viking	6,000	Strat.	3,800	11.0	65	8.2		2-5	8.2	63.9	41	2.1
Gilby, West	1953	41-3w5	Viking	6,400	Strat.	320	8.6	40	11.5		2	0.5	66.1	39	10.1
Giroux Lake	1955	65-20w5	Gran. W.	10,000	Strat.	160			20	(?)	0-1		0	42	
Glenevis	1954	55-4w5	Miss.	4,500	Struc.	600	11.0	500	31	Water	1-7	5.0	54.7	18	0.45
Glen Park	1951	49-27w4	Dev. D2	5,700	Reef	80	3.6	360	30	Water	1	0.7		36	4.0
			Dev. D3	6,350	Reef	1,000	9.5	2,700	137	Water	11-12	25.3	1,806	38	6.0
			L. Cret.	4,500	Strat.	250	14.9	110	16	Comb.	3	0.2		30	7.3
Golden Spike:															
South D2	1949	51-27w4	Dev. D2	4,900	Reef	720	4.6	150	37	Water	9	2.5		38-39	2.9
Other D2			Dev. D2	4,900	Reef	160	7.8	1,400	20	Water	2	0.5	11,835	37	5.6
South D3			Dev. D3	5,700	Reef	1,120	9.2	740	520	Water	7	150		37	4.0
Other D3			Dev. D3	5,700	Reef	400	10.0	175	35	Sol. gas	5	1.5		37	5.4
Gordondale	1952	79-11w6	L. Cret.	2,900	Strat.	1,000			33		0-6	179 Bill.	0	Gas	
	1953		L. Cret.	4,500	Strat.				25						
Grassy Lake	1953	11-13w4	Jurassic	3,100	Struc.	320			12		0-2	0.3	53	(?)	
Greencourt	1954	58-9w5	Miss.	5,000	(?)	80			80		0-1		0	25-30	
Greenglade	1954	41-1w4	L. Cret.	2,750	Strat.	80			10		1		6.5	18	
Gilwood	1954	73-18w5	B. Dev.	8,100	(?)	80			25		1		30	39	
Hamelin Creek	1951	80-6w6	L. Cret.	3,200	Strat.	600			26		0-3	45 Bill.	0	Gas	
Hamilton Lake	1952	35-9w4	Viking	3,000	Strat.	2,320	22.5	110	5.7	Sol. gas	23-29	7.0	305.6	30-32	0.76
			Viking	3,000	Strat.	160					1	40 Bill.	257 Mill.	Gas	
Harmattan	1955	32-4w5	Miss.	8,950	Strat.	4,000	12.0		30	Sol. gas	3-4	16.7	30.9	35	
Hespero (Medin)	1954	38-3w5	Dev. D2	8,700	Reef	160	11.0		25	Comb.				44	
			Dev. D3	8,900	Reef	160	7.0			Comb.	4	7		42	
			Miss.	7,200	Struc.	1,500	13.0		50	Comb.				28	
Homeglen-Rimbey	1953	43-1w5	Dev. D3	8,000	Reef	1,800	8.4	2,300	25	Water-gas	20-22	17	850.7	40	0.81
						550			20	Gas	3 gas	700 Bill.	1,774 Mill.	Gas	
Hussar	1955	24-20w4	B. Blair.	4,480	Strat.	160			34		0-1		0	Gas	
Jenner	1954	22-9w4		3,300	Strat.	160				Sol. gas	0-2		2.4	18	
Joarcam	1949	50-22w4	Viking	3,300	Strat.	20,000	17.3	590	11.7	Water	420-474	73.0	19,100	37	8.1
Joffre	1953	38-25w4	Viking	4,960	Strat.	18,000	12.0	405	6.2	Sol. gas		11.6		40	4.9
Joffre, West	1956	39-27w4	Viking	5,100	Strat.	2,500	11.2	340	19.7	Sol. gas	226-233	1.7	3,298	40	
Jumping Pound	1944	25-5w5	Miss.	9,800	Struc.	500			145	Gas	9-12	6.0	551.8	51-57	
			Miss.			6,400					10 gas	340 Bill.	58 Bill.	Gas	
Kessler	1953	38-8w4	Viking	2,500	Struc.	160			10	Sol. gas	0-2	0.1	22.5	38	
						1,600					10 gas	100 Bill.	27.2 Mill.	Gas	
Lac St. Anne	1952	55-2w5	Dev. D1	5,700	Reef	160			25	(?)	1-2		35	37	
Leduc:															
Gilbert	1948	50-26w4	L. Cret.	4,100	Struc.	450	19.0	20	21	Comb.	10-11	3.5		37-39	11.8

*First figure is number producing; second figure is number capable of producing.

A JOURNAL TECH-REPORT

FIELD AND RESERVOIR DATA

Field	Discov. Date	Location Twp.& Rge.	Produc. Name	Av. Depth	Struct.	Area Ac.	Reservoir Characteristics				No. Wells*	Ult. Rec. Mill. Bbl.	Cum. Rec. Thous. Bbl.	Gravity A.P.I.	% Depletion
							% Por.	Perm.	Thick.	Drive					
N. Woodbend	1951		L. Cret.	4,100	Struc.	400	17.0	230	21	Comb.	8-10	2		38	9.0
W. Devon	1951		L. Cret.	4,100	Struc.	120	14.4	180	10	Comb.	3-3	0.35	126,458	35	5.7
Other L. Cret.			L. Cret.	4,100	Struc.	200					4-5				
Dev. D2	1947		Dev. D2	4,900	Reef	30,000	3.0	115	63	Sol. gas	652-709	62		38-40	13.4
Dev. D3	1947		Dev. D3	5,250	Reef	25,000	10.0	815	32	Water	532-536	170		40-42	2.5
Legal	1952	57-25w4	Viking	2,850	Strat.	1,100	15.0	360	8	Water	5-7	0.7	209.3	31	10.5
Leslieville	1954	39-5w5	Cardium	6,000	Strat.	2,200	10.0		14	Sol. gas	1	3.2	0.3	37	
Lindbergh	1946	56-5w4	L. Cret.	1,400	Struc.	800			10		4-5	7 Bill.	1.7 Bill.	Gas	
Little Smoky River	1954	67-22w5	Dev. D3	8,765	Reef	320	7.5	490	45	Comb.	3	1 (14 Bill. gas)	157.5	38	3.7
Little Smoky Lake	1951	75-22w5	L. Cret.	3,100	Struc.	160			12		0-1	6 Bill.	0	Gas	
Lloydminster	1939	49-1w4	L. Cret.	1,680	Strat.	2,500			5		16-19	9 Bill.	2.3 Bill.	Gas	
	1943	49-1w4	L. Cret.	1,900	Strat.	16,000			20	Sol. gas	164-386	10	8,242	9-19	
Lone Pine Creek	1955	30-27w4	Dev. D1	7,430	Reef	160			20		0-1		0	Gas	
Majeau Lake	1951	56-4w5	Miss.	4,600	Strat.	640			35		0-2		0	Gas	
Maimo	1952	44-22w4	Dev. D2	4,900	Reef	1,460	4.3	240	51	Comb.	26-28	6		38-40	7.7
			Dev. D3	5,250	Reef	600	6.8	330	44	Gas	14	3.5	2,632	34	7.1
			L. Cret.	4,500	Struc.	300	21.0	585	13	Comb.	8-9	1.5		39	4.5
Manyberries, E.	1955	5-4w4	L. Cret.	4,000	Struc.	80			10	(?)	1		13	38	
						160			10		1	30 Bill.	1 Mill.	Gas	
Medicine Hat	1904	12-5w4	U. Cret.	1,100	Struc.	13,000			10		68-83	764 Bill.	188 Bill.	Gas	
Medin (see Hespero)															
Morinville	1948	56-25w4	Blairmore	3,700	Struc.	2,300			30		12-14	128 Bill.	11.8 Bill.	Gas	
	1953	55-25w4	Dev. D1	3,800	Reef	160			16	Sol. gas	1		24.3	37	
Namao	1951	54-25w4	Blairmore	3,750	Struc.	1,200	19.4	305	12	Comb.	5-16	2.7	244.1	28-33	8.6
Namepi Creek	1954	58-21w4	Blairmore	2,650	Strat.	320			30		0-2		0	Gas	
Nevis	1952	38-22w4	Dev. D2	5,700	Reef	80			20	Comb.	1		46.3	38	
			Dev. D3	5,630	Reef	320			65	Comb.	1-2	614 Bill.	66.2 Mill.	Gas	
New Norway	1951	44-22w4	Dev. D2	4,500	Reef	900	8.5	420	57	Water	11	6.2		40	11.8
			Dev. D3	4,900	Reef	500	4.5	350	33	Water	6	1.5	1,462	32-36	22.0
			L. Cret.	3,600	Struc.	80				Sol. gas	0-1	0.3		38	0.4
Normandville	1949	79-22w5	L. Cret.	2,450	Strat.	160			25		0-1	7 Bill.	35.3 Mill.	Gas	
			Dev. D3	6,700	Reef	80			25	Comb.	1	0.5	89.1	38	
Oberlin	1949	38-21w4	Blairmore	4,600	Strat.	250			10	Gas	0-3		4.7 (plus 712 Mill.)	Gas	
Oyen	1949	29-5w4	Viking	2,600	Struc.	320			13		0-2	17 Bill.	0	Gas	
Peavey	1951	56-24w4	Viking	2,800	Strat.	80			16	(?)	1	1.5		26	
			B. Qtz.	3,700	Strat.	500	18.4	385	6	(?)	7-9	3.0	189	26	1.9
Pembina	1953	48-8w5	Belly R.	4,300	Strat.	600			25	Sol. gas	7-8		71.8	35	0.37
			Cardium	5,120	Strat.	400,000	14.2	15	19-25	Sol. gas	946-1,025	1,000	25,603	37	
Pendant D'Oreille	1946	2-8w4	Bow Is.	2,100	Struc.	2,000			12		12	160 Bill.	33.1 Bill.	Gas	
Phil Can	1952	89-4w6	L. Cret.	3,140	Struc.	160			30		0-1	9 Bill.	0	Gas	
			Miss.	3,640	Struc.	160			10		0-1	4 Bill.	0	Gas	
Picardville	1949	58-27w4	Viking	2,650	Struc.	500			13		0-3	22 Bill.	462 Mill.	Gas	
Pincher Creek	1948	3-29w4	Miss.	12,000	Struc.	1,000			220		0-6	2 Trill.	600 Mill.	Gas	
Pine Coulee	1955	15-28w4	Miss.	8,785	Struc.	160			50		0-1		0	Gas	
Pouce Coupe	1943	80-13w6	L. Cret.	2,160	Strat.				20			210 Bill.		Gas	
Pouce Coupe Center	1954	79-12w6	L. Cret.	2,400	Strat.				30			50 Bill.		Gas	
Pouce Coupe, S.	1953	78-13w6	L. Cret.	3,260	Strat.				70			165 Bill.		Gas	
Princess	1939	20-12w4	L. Cret.	2,750	Struc.	500			10		0-3			28	
			L. Cret.	3,200	Struc.	350			30		0-2	168 Bill.	945 oil,	29	
			Miss.	3,300	Struc.	1,000			32		0-12	gas	5.8 Bill.	25	
			Dev.	3,900	Struc.	500			30		0-4		gas	23-26	
Provost	1946	37-3w4	Viking	2,340	Struc.	6,000			66		0-35	550 Bill.	22 Mill.	Gas	
			Blairmore	2,500	Strat.	160			11		0-1		1.7	29	
Red Coulee	1952	1-16w4	Blairmore	2,650	Struc.	500			15	Sol. gas	1-6	0.5	342.0	26	
Redland	1955	28-22w4	Viking	4,100	Strat.	160			38		0-1		0	Gas	
Redwater	1948	57-21w4	Dev. D3	3,300	Reef	36,000	5.8	710	116	Water	879-905	769.2	149,095	35	10.9
Reno	1954	80-17w5	Dev.	6,700	Struc.	80			80		1		26	35	
Rocky Mountain House	1954	42-8w5	Cardium	6,400	Strat.	6,500	15.0	14	13	Sol. gas	11	3.7	58.9	37-39	0.2
Rosebud	1955	26-21w4	B. Blair.	4,800	Strat.	160			30		0-1		0	Gas	
Rycroft	1952	77-4w6	L. Cret.	4,175	Struc.	500			35		2	11 Bill.	0.6 oil, 1 Bill. gas	Gas	
St. Albert	1953	54-26w4	Dev. D3	4,900	Reef	320	9.3	650	66	Water	4	2.2	337.6	34	4.1
			L. Cret.	4,700	Strat.	500			10		4	70 Bill.	7.7 Bill.	Gas	
St. Paul	1947	58-9w4	L. Cret.	1,550	Strat.	650			6		4	2 Bill.	1.2 Bill.	Gas	
Samson	1953	44-24w4	L. Cret.	4,900	Struc.	250	18.6	500	12.3	Water	3	1.8	40.1	28	0.5
Savanna Creek	1954	14-4w5	Miss.	7,500	Struc.	320			1,000		0-2	1 Trill.	0	Gas	

*First figure is number producing; second figure is number capable of producing.

A JOURNAL TECH-REPORT

FIELD AND RESERVOIR DATA

Field	Discov. Date	Location Twp.& Rge.	Produc. Name	Av. Depth	Struct.	Area Ac.	Reservoir Characteristics				No. Wells*	Ult. Rec. Mil. Bbl.	Cum. Rec. Thous. Bbl.	Gravity A.P.I.	% Depletion
							Por.	Perm.	Thick.	Drive					
Sibbald	1950	28-2w4	Viking	2,450	Struc.	1,500			25		0-9	33 Bill.	0	Gas	
Skaro	1951	57-19w4	Dev.	3,700	Strat.	320			20		0-4	0.1	21.7	39.6	4.2
Smith Coulee	1947	3-10w4	Bow. Is.	2,000	Strat.	500			4		1	8 Bill.	802 Mill.	Gas	
Spring Coulee	1950	3-23w4	Miss.	6,000	Struc.	320	3.0		59	(?)	2-4	0.62	36.4	36-39	1.1
Stettler	1949	38-20w4	Blairmore	4,250	Struc.	160			15		2	24		31	
			Dev. D2	4,900	Reef	4,350	4.1	960	64	Water	69-72	15	5,329	28-30	5.7
			Dev. D3	5,400	Reef	2,110	6.4	800	30	Water	28-30	8		27-30	6.0
Sturgeon	1951	54-26w4	L. Cret.	5,600	Struc.	250			45		3	451 Bill.	696 Mill.	Gas	
Sturgeon Lake	1952	71-23w5	Dev. D3	8,650	Reef	2,300	5.3	655	65	Water	15-17	13.5	236.2	37-38	0.3
Sturgeon Lake, South	1953	69-22w5	Dev. D3	8,480	Reef	10,000	4.7	650	102	Water	49-50	87	1,260.4	37-38	0.3
	1955		Triassic	4,950	Strat.	80					2	(?)	14.4	37	0.2
	1955		Miss.	5,300		80					0-1	0.7	0	38	
Suffield	1941	15-9w4	U. Cret.	1,000	Strat.	2,700			40		16-17	19 Bill.	1.6 Bill.	Gas	
Sundre	1955	34-5w5	Miss.	9,200	Strat.	1,500	8.0	160	75	Water	13-17	27.6	392.7	32-36	0.26
			L. Cret. and Jurassic	3,100	Struc.	1,600			35	Comb.	17-19		1,884.5	18-22	
Taber	1937	9-17w4	L. Cret.	2,400	Strat.	800			18		0-5	100 Bill.	0	Gas	
Tangent	1951	80-24w5	Triassic	2,840					13			70 Bill.	0	Gas	
Three Creeks	1952	86-19w5	L. Cret.	1,670	Struc.	160			28		0-1	10 Bill.	0	Gas	
Tilley	1940	17-12w4	Blairmore	1,250	Struc.	350			15		2		300 Mill.	Gas	
Turner Valley	1924	20-2w5	Miss.	3,450	Struc.		10.0	10	100	Comp.	1-2 (oil) 2.7 (gas)	370 Bill.	111,095 (oil)	35	
	1936		Miss.	8,000	Struc.		10.0	10	145	Comb.	240-302 oil, 38-78 gas	127 oil, 380 Bill. gas	1.7 Trill.	40-42	
Valley View	1951	71-21w5	L. Cret.	2,810	Struc.	160			17		0-1	11 Bill.	0	Gas	
Vermilion	1939	50-5w4	L. Cret.	1,850	Struc.	1,500			10	Sol. gas	0-17		1,347.2	7-15	
Viking-Kensella	1914	48-13w4	Viking	2,100	Struc.	20,000			10		73-105	592 Bill.	264 Bill.	Gas	
Vilmer, West	1955	55-25w4	Dev. D3	4,600	Reef	80			30	Comb.	1		20	33	
Wainwright	1926	45-6w4	L. Cret.	2,250	Struc.	3,000			20	Sol. gas	60-75		896.6	18-22	
Wayne	1954	27-20w4	L. Cret.	4,500	Strat.	500	15.6	40	49	(?)	7	11.9	115.3	29	0.25
Westerose	1952	46-28w4	Dev. D3	7,050	Reef	1,800	9.4	1,390	196	Sol. gas	14-19	52.2	4,893.7	41	2.8
Westward Ho	1955	33-4w4	Miss.	8,650	Struc.	5,000	5.5	44	55.7	(?)	8-10	11.6	191.3	35	0.8
Whitelaw	1950	81-1w6	L. Cret.	2,800	Strat.	500			14		2-3	165 Bill.	793 Mill.	Gas	
			Triassic	3,200	Strat.	80			20		0-1		11.3	Oil	
Whitemud	1949	51-25w4	Blairmore	4,100	Struc.	400	21.0	425	12	(?)	2-4	0.3	167.2	39	11.5
Wildmere	1939	49-6w4	L. Cret.	1,600	Struc.	2,500			10		4-14	11 Bill.	6 Bill.	Gas	
Wimborne	1954	34-26w4	Dev. D3	7,465	Reef	80			31	Comb.	1		4.9	38	
Wintering Hills	1955	24-18w4	Blairmore	4,240	Struc.	160			27		0-1		0	Gas	
Wizard Lake	1951	48-27w4	Dev. D3	6,350	Reef	2,000	8.4	1,220	338	Water	50-51	80.5	13,882	41	4.6
			L. Cret.		Struc.	80				Sol. gas	0-1		0.6	29	

Saskatchewan

Alida	1954	5-33wPM	Miss. C.	3,700	Comb.†	2,831	15		36	Comb.	28	12.9	365.3	39	
Antelope	1954	32-28w3	Viking	2,500	Comb.	640			4		1	54 Mill.		Gas	
Antelope Lake	1955	16-18w3	Blairmore	3,100	Comb.	640			12		1	2.6 Bill.		Gas	
Antler River	1955	3-33wPM	Miss.	3,900	Comb.	40			32		0-1	Abnd.	0	36	
Battle Creek	1952	3-26w3	Jurassic	4,300	Comb.	640			17		1	7 Bill.		Gas	
Battrum	1955	18-17w3	Blairmore	2,880	Comb.	3,204	26		37	Water	31	21.5	144.9	18	
Beverley	1955	15-16w3	Roser.	3,200	Comb.	640			10		0-1			Gas	
Birling	1949	48-22w3	Sparky	1,840	Strat.	80	25			Sol. gas	6	1.2		12	
Bone Creek	1954	10-19w3	Jurassic	4,400	Comb.	1,000	13		25	Sol. gas	11	4.5	85.5	24	
Brock	1951	28-20w3	Viking	2,375	Comb.	16,000	24		11		13	20.9 Bill.	3.4 Bill.	Gas	
Buffalo Coulee	1952	32-24w3	Miss.	2,630	Comb.	2,560	24		19	Gas	4	73.0	194.8	11	
Cabri Lake	1955	24-26w3	Viking	2,200	Comb.	80				Sol. gas	1			35	
Cantuar	1952	16-17w3	Blairmore	3,150	Strat.	1,100	20		32	Sol. gas	125	47.1	1,005.1	12-23	
			Jurassic	3,275	Strat.	12,300	24		15	Sol. gas	27	18.0	79.1		
Carnduff	1955	2-33wPM	Miss.	3,975	Comb.	80			30		1		0	35	
Coleville	1951	31-23w3	Viking	2,300	Comb.	61,200	24		35	Sol. gas	37	325 Bill.	4 Bill.	Gas	
			Miss.	2,700	Comb.	6,500	25		32	Gas	200	43.8	4,098.3	14	
Cook Lake	1953	31-21w3	Viking	2,215	Comb.	3,840	16.7				2	3.6 Bill.		Gas	
Dollard	1953	7-20w3	Jurassic	4,600	Comb.	13,000	19		24	Water	13	52.9	831.0	18	
Eastend	1952	6-20w3	Jurassic	4,700	Comb.	2,960	8		30	Sol. gas	6	9.9	21.9	21	
Eastside	1954	29-29w3	Miss.	2,900	Comb.	640			20		0-1	3.5 Bill.		Gas	
Eatonia	1951	26-24w3	L. Cret.	3,000	Comb.	160	20		7		2			12	
Eureka	1954	31-23w3	Viking	2,375	Comb.	3,221	24		10	Sol. gas	42	7.9	596.6	36	

*First figure is number producing; second figure is number capable of producing. †Except where otherwise noted, all fields must be considered combination structural and stratigraphic traps.

A JOURNAL TECH-REPORT

FIELD AND RESERVOIR DATA

Field	Discov. Date	Location Twp.& Rge.	Produc. Name	Av. Depth	Struct.	Area Ac.	Reservoir Characteristics				No. Wells*	Ult. Rec. Mill. Bbl.	Cum. Rec. Thous. Bbl.	Gravity A.P.I.	% Deple-tion
							% Por.	Perm.	Thick.	Drive					
Flaxcombe	1955	30-26w3	Viking	2,450	Comb.†	80			35		1			35	
Forget	1953	9-7w2	Miss. C.	3,900	Comb.	80	15		15		2		40.9	31	
Fosterton	1952	17-18w3	Roser.	3,100	Comb.	2,430	26		35	Sol. gas	54	40.6	1,652.0	24	
Frenchman's Cr.	1955	4-20w3	Jurassic	4,625	Comb.	160	16		12		2			25	
Frobisher	1954	3-4w2	Charles	4,600	Strat.	2,728	9.5		28	Sol. gas	29	8.1	141.9	36	
			Miss. C.	4,650	Struc.	1,843	10		38	Water	8	3.5	262.2	39	
Glidden	1953	27-24w3	Viking	2,300	Comb.	1,920	13.5		10		3	2.2 Bill.		Gas	
Grattle	1955	30-29w3	Viking	2,300	Comb.	640			35		1			Gas	
			Miss.	2,770		640			28		1	11 Bill.		Gas	
Greene	1955	30-28w3	Miss.	2,850	Comb.	640					0-1			Gas	
Gull Lake	1952	13-19w3	L. Cret.	3,600	Comb.	3,200	23		20	Gas	55	10.0	1,077.6	24	
			Jurassic	3,900	Comb.	1,920			10		3			Gas	
Halbrite	1955	6-12w2	Miss.	4,720	Comb.	320	13		42	Sol. gas	4			30	
Hastings	1955	4-33wPM	Miss.	3,950	Comb.	1,200	8		35	Sol. gas	15	2.2	51.0	35-38	
Hatton	1954	13-29w3	U. Cret.	1,600	Comb.	152 M.			35		14	133 Bill.		Gas	
Hilldale	1955	32-27w3	Viking	2,400	Comb.	80			30		1	1.7 Bill.		35	
Hoosier	1952	31-28w3	L. Cret.	2,800	Comb.	160	10		24		2		40.1	16	
Hoosier, North	1954	31-27w3	Viking	2,400	Comb.	640			70		0-1			Gas	
Ilerbrun, South	1954	10-18w4	Jurassic	4,570	Comb.	80			21		1	0.4	1.0	23	
Ingoldsby (see Nottingham)															
Instow	1954	9-18w3	Jurassic	4,600	Comb.	2,665	15		40	Sol. gas	12	3.2	26.2	23	
Jaya	1953	15-15w3	Jurassic	3,250	Comb.	480	18		25	Sol. gas	5	1.6	8.5	14	
Kingsford	1955	4-6w2	Miss.	4,700	Comb.	760	12		45	Sol. gas	9	2.3	6.0	26-30	
Lampman	1954	5-6w2	Charles	4,500	Comb.		10		25	Sol. gas		2.3	26.8	35	
			Miss. C.	4,550	Comb.	480	8		14	Sol. gas	7	0.5	11.0		
Leon Lake	1953	8-19w3	Jurassic	4,500	Comb.	532	15		30	Sol. gas	4	0.9	17.2	22	
Lloydminster	1935	49-28w3	Sparky	1,300	Strat.	3,500	25		14	Comb.	22	8.4 Bill.	4.8 Bill.	Gas	
	1943		Sparky	1,900	Strat.	4,370	25		14	Comb.	270	20.3	6,132.0	10-18	
Lone Rock	1946	47-27w3	Sparky	1,900	Strat.	3,120	25		15	Sol. gas	162 oil	13.2	4,577.0	10	
			Colony								5 gas	0.5 Bill.	81 Mill.	Gas	
Loverna	1955	32-28w3	Viking	2,350	Comb.	80			17		1			30	
Maidstone	1949	49-23w3	Colony	1,500	Strat.	200	25		12	Sol. gas	11	0.3	56.8	10	
Marengo	1953	28-27w3	Viking	2,500	Comb.	1,280			30		0-2	1.5 Bill.	22 Mill.	Gas	
			L. Cret.	2,900	Comb.	40			15		1		7.9	14	
Marsden	1949	44-28w3	Sparky	2,000	Strat.	200	25		10	Sol. gas	11	0.5	244.1	14	
McLaren	1948	50-25w3	Sparky	1,750	Strat.	520	25		10	Sol. gas	26	3.2	264.2	14	
Midale	1953	6-10w2	Charles	4,600	Strat.	12,000	12	5-500	48	Sol. gas	106	36.7	907.9	27	
			Miss. C.	4,650	Strat.	240	9		45	Sol. gas	8	2.0	37.3	29	
Midway	1952	14-19w3	L. Cret.	3,600	Comb.	160	23		20	Sol. gas	1		0.08	24	
Milton	1954	30-27w3	Viking	2,400	Comb.	640			7		2	2 Bill.		Gas	
Moose	1953	9-6w2	Miss. C.	4,000	Comb.	160	12		30	Sol. gas	2		35.8	27	
North Premier	1953	15-18w3	Vangd.	3,400	Comb.	2,372	25		32	Sol. gas		8.1	0.2	24	
			Shaun.		Comb.	1,767	17.5		8	Sol. gas	11	1.4	2.3	24	
Nottingham	1954	4-32wPM	Miss. C.	3,550	Comb.	5,700	14		45	Sol. gas	62	29.0	270.0	37-39	
Prelate	1955	23-25w3	Viking	2,160	Comb.	640			10		0-1	1 Bill.		Gas	
Rapdan	1953	4-20w3	Jurassic	4,600	Comb.	640	19		20		4	2.6	32.5	23	
Ratcliffe	1952	1-15w2	Miss. C.	6,500	Comb.	320	9		36		2		31.0	31	
Roscommon	1955	12-20w3	Jurassic	3,838	Comb.	80			20		0-1			25	
St. Florence	1954	30-24w3	Viking	2,250	Comb.	160	10		12		2			36	
Smiley	1953	31-25w3	Vik. sd.	2,300	Comb.	9,230	28		11	Sol. gas	83	24.1	583.2	36	
			Vik. ch.	2,400	Comb.	6,182	28		4	Gas	51	14.5	837.9	36	
Steelman	1955	4-5w2	Charles	4,800	Strat.	4,760	12		25	Sol. gas	54	50.0	340.7	36	
Success	1952	17-16w3	Cantuar	3,050	Comb.	1,120	23.7		16	Gas	6	10.8 Bill.	10 Mill.	Gas	
			Roser.	3,100	Comb.	4,031	23		20	Gas	78	34.0	2,056.7	22	
Unity End Lake	1944	29-23w3	Viking	1,659	Comb.	6,870	21.6		4	Sol. gas	2	7.6 Bill.	3.8 Bill.	Gas	
			Blairmore	2,100	Comb.	4,900	26		30	Sol. gas	3	14.9 Bill.	0.4 Bill.	Gas	
Verendrye	1954	28-23w3	Viking	2,300	Comb.	640			12		0-1	61 Mill.		Gas	
Verlo	1955	16-20w3	Jurassic	3,370	Comb.	80			8		0-1			Gas	
Wapella	1952	14-1w2	L. Cret.	2,200	Comb.		30		17	Comb.		1.3	345.3	26	
			Jurassic	2,500	Comb.	800	26		10	Comb.	25	1.1	295.6	26	
Wapella, North	1954	15-1w2	Jurassic	2,230	Comb.	80			59		1			22	
Warrior	1955	27-25w3	Viking	2,560	Comb.	640			23		0-1			Gas	
Waseca	1950	49-24w3	Sparky	1,700	Strat.	359	25		13	Sol. gas	7	0.2	90.0	12	
Weyburn	1954	7-13w2	Miss. C.	4,450	Strat.	1,900	15	5-500	15	Sol. gas	13	7.1	103.4	35	
White Bear	1954	9-3w2	Miss. C.	4,100	Comb.	80			23		1			28	

*First figure is number producing; second figure is number capable of producing. †Except where otherwise noted, all fields must be considered combination structural and stratigraphic traps.

A JOURNAL TECH-REPORT

FIELD AND RESERVOIR DATA

Field	Discov. Date	Location Twp.& Rge.	Produc. Name	Av. Depth	Struct.	Area Ac.	Reservoir Characteristics				No. Wells*	Ult. Rec. Mill. Bbl.	Cum. Rec. Thous. Bbl.	Gravity A.P.I.	% Depletion
							% Por.	Perm.	Taick.	Drive					
Manitoba															
Bekker	1954	10-25wPM	Miss.	1,750	Struc.	40			7		1	0.05		34	
Butler, West	1955	9-29wPM	Miss.	2,900	Struc.	240	10		50		3	1.0		33	
Coulter	1952	1-27wPM	Miss.	3,200	Struc.	80			7		2	0.05		34	
Daly-Cromer	1951	10-28wPM	Miss.	2,500	Comb.	8,000	9-11	0.5-4	100	Comb.	200	42.0	3,742.8	33	
Ebor	1954	9-29wPM	Miss.	2,650	Struc.	500	8		58	Comb.	11	2.5	59.5	34	
Ebor, West	1954	9-29wPM	Miss.	2,750	Struc.	80	9		60		2	0.5		35	
Hargrave	1955	11-27wPM	Miss.	2,170	Comb.	40	8		12		1			34	
Kirkella	1955	12-29wPM	Miss.	2,400	Struc.	80	9		15		2	0.1		33	
Lulu Lake	1952	1-21wPM	Miss.	3,300	Struc.	120	8		25		3	0.3	28.1	34	
Maon	1955	9-25wPM	Miss.	2,100	Struc.	40					1			35	
Maples	1955	10-26wPM	Miss.	2,100	Struc.	520	10		10		13	1.0	97.1	32.8	
Pierson	1954	3-29wPM	Miss.	3,300	Struc.	400	9		30		9	1.0	87.2	34.4	
Regent	1955	4-22wPM	Miss.	2,500	Struc.	80	10		28		2	0.3		34	
Regent, South	1954	4-21wPM	Miss.	2,500	Struc.	160	10		50		4	0.8		35	
Routledge	1955	9-25wPM	Miss.	2,050	Strat.	320	10		20	Water	10	1.0	47.2	35	
Tilston	1952	5-29wPM	Miss.	3,100	Struc.	200			50		5	0.9	58.8	33	
Virden-Roselea	1953	10-26wPM	Miss.	2,050	Struc.	6,560	10	35-40	20	Comb.	164	12.7	2,529.8	34.5	
Virden, North	1953	11-26wPM	Miss.	2,000	Struc.	5,200	12	35-40	42	Sol. gas	137	14.0	1,714.7	35	
Virden, South	1955	9-26wPM	Miss.	2,150	Struc.	40	10	35		Sol. gas	1	0.5		35	
Whitewater	1953	3-21wPM	Miss.	2,550	Struc.	250	9		25		6	0.8	65.7	35	
Woodnorth	1954	8-27wPM	Miss.	2,450	Struc.	600	10		13	Water	15	0.8	314.2	33.6	
British Columbia															
Blueberry	1955	56°56'N 122°3'W	Triassic	4,850	Struc.	3,000					0-5	200 Bill.	10	Gas	
Bougie Creek	1955	57°57'N 122°29'W	Miss.	6,500	Struc.	640					0-1		0	Gas	
Boundary Lake	1955	86-13w6	Triassic	4,323	Struc.	160					0-2		0	34.5	
Buick Creek	1953	89-20w6	Cret.	3,600	Struc.										
			Jurassic	3,900	Struc.	6,000					0-9	330 Bill.	0	Gas	
			Triassic	4,700	Struc.										
Cameron River	1955	56°42'N 122°29'W	Triassic	5,096	Struc.	640					0-1		0	Gas	
Dawson Creek	1956	78-14w6	Per.-Penn.	7,950	Struc.	640					0-1		0	Gas	
Doig River	1955	88-17w6	Jurassic	3,774	Struc.	640					0-1		0	Gas	
Fort St. John	1951	83-19w6	L. Cret.	3,000	Struc.										
			Tri. 3,800	-5,800	Struc.	10,000			100		0-15	3 Trill.	0	Gas	
			Per.-Penn.	6,300	Struc.										
	1956	83-18w6	Per.-Penn.	6,400	Struc.	40					0-1		0	42	
Halfway Lake	1954	87-25w6	L. Cret.	3,745	Struc.										
			Triassic	3,745	Struc.	1,200					0-2		0	Gas	
			Per.-Penn.	6,400	Struc.										
			Miss.	6,600	Struc.	640			60		0-1			Cond.	
Klua Creek	1956	58°32'N 122°22'W	Devonian	6,850	Struc.	640								Gas	
Milligan	1955	57°4'N 120°22'W	Jur.-Cret.	3,424	Struc.	640					0-1		0	Gas	
			Triassic			640					0-1		0	Gas	
Montney	1954	86-19w6	Triassic	3,600	Struc.	1,920					0-3	30 Bill.	0	Gas	
Nig Creek	1954	57°3'N 121°44'W	Triassic	4,200	Struc.	1,200					0-2		0	Gas	
Paddy	1955	57°47'N 120°14'W	Devonian	7,934	Strat.	640					0-1		0	Gas	
			Triassic												
Pingel Creek	1953	81-18w6			Struc.	1,920					0-3	241 Bill.	0	Gas	
Sunrise	1951	79-16w6	L. Cret.	3,200	Struc.	1,280					0-2	62 Bill.	0	Gas	
Northwest Territories															
Norman Wells	1920	65°15'N‡ 126°18'W	Devonian	1,500	Reef	4,000			400	Water	18-61	58.5	4,792.7	39-41	
Rabbit Lake	1955	60°56'N 118°47'W	Devonian	2,600	Struc.	640			25		0-1		0	Gas	

*First figure is number producing; second figure is number capable of producing. †All wells in all fields capped awaiting outlet. ‡Approximate.

A JOURNAL TECH-REPORT

FUNDAMENTAL CRUDE-OIL CHARACTERISTICS

Field	Grav. °A.P.I.	Sulfur % (wt.)	Color	Viscos. S.U.S. 100° F.	Pour Point °F.	Gaso. & Naphtha %	Kero. Dist. %	Dies. Fuel %	Gas Oil %	Visc. Dist. %	Resid. %	Resid. Grav. A.P.I.
ALBERTA												
Acheson	36.9	0.34	Black	39.5	20	38.0	14.1	12.1	3.8	16.8	15.2	13.4
Bonnie Glen-Wizard Lake (mixture)	40.3	0.17	Dk. Gr.	35.8	0	42.7	13.1	13.1	2.0	18.9	9.6	14.6
Excelsior	36.4	0.54	Dk. Gr.	43.0	35	30.0	14.0	10.6	12.3	6.6	26.5	15.1
Fenn Big Valley	34.0	0.76	Black	46.2	25	32.2	10.9	10.2	6.4	19.3	20.9	12.7
Golden Spike	35.7	0.65	Dk. Gr.	40.2	—10	35.0	16.7	8.9	9.4	6.3	23.7	15.1
Joarcam	37.2	0.13	Dk. Gr.	42.9	40	30.9	16.0	14.4	5.7	16.4	16.6	17.4
Leduc	39.2	0.32	Dk. Gr.	41.1	5	41.2	15.1	11.8	2.2	16.8	12.9	16.2
Pembina	37.1	0.15	Green	43.8	40	32.5	12.5	13.9	2.9	20.8	17.4	15.5
Redwater	34.0	0.61	Dk. Gr.	44.4	20	33.2	15.0	12.2	2.7	19.4	17.5	10.0
Stettler	28.4	1.52	Black	56.5	0	31.1	12.6	9.5	3.1	19.5	24.2	5.8
Sturgeon Lake, South	38.2	0.38	Dk. Gr.	35.9	10	39.0	16.7	13.5	4.7	5.5	20.6	18.2
Wizard Lake	37.9	0.22	Dk. Gr.	38.5	—20	36.8	14.9	12.9	3.4	20.8	11.2	10.8
SASKATCHEWAN												
Cantuar	22.2	3.00	Black	294.0	10	17.4	13.9	7.0	7.2	11.4	43.1	5.9
Fosterton	22.7	2.80	Black	247.0	10	17.8	13.1	6.6	10.7	7.7	44.1	7.0
Coleville	13.5	3.16	Black	282.5	—15	5.8	10.9	10.7	3.0	21.4	48.2	4.2
Lloydminster	15.6	3.26	Black	480.4	5	3.1	11.5	8.0	7.5	8.8	61.1	6.2
Midale	27.6	1.20	Black	65.0	20	24.8	14.3	8.0	10.4	6.6	35.9	7.9
Success	20.9	3.07	Black	309.0	5	15.2	13.3	7.8	5.4	12.8	45.5	6.2
MANITOBA												
Virden	34.7	1.25	Brown	41.6	—20	33.4	15.0	12.4	4.9	20.8	13.5	8.4
ONTARIO												
Welland	42.6	0.05	7 Union	42.2	45	31.0	18.1	10.8	5.7	17.3	17.1	27.2
Petrolia	31.5	1.12	Brown	153.0	0	18.5	18.0	8.8	11.9	11.8	31.0	27.6
Rodney	37.6	0.88	Dk. Gr.	44.9	—50	28.0	18.0	14.0	4.6	6.8	28.6	22.5

A JOURNAL TECH-REPORT

PIPELINE TARIFFS

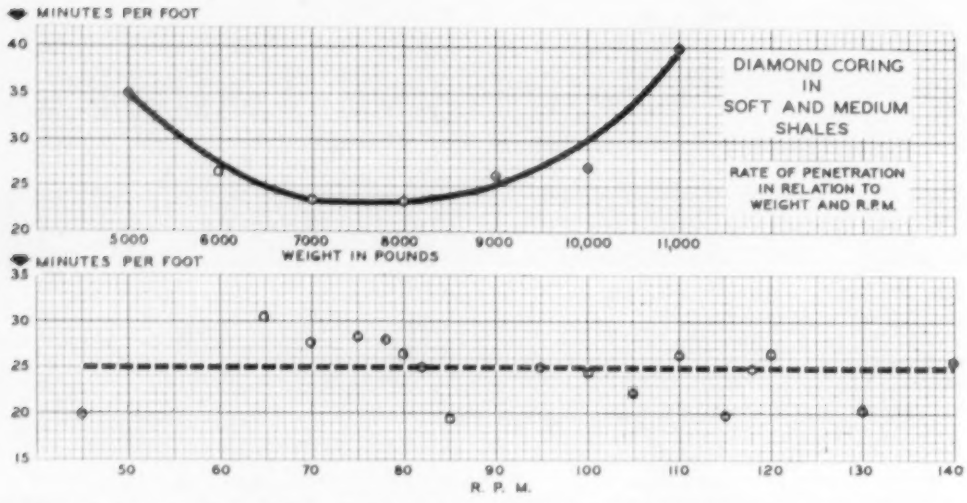
Alberta Pipelines	Cents
Turner Valley to Calgary refineries	16.0
Turner Valley to Turner Valley refinery	10.0
Leduc Woodbend—Golden Spike—Acheson to Edmonton refineries, Interprovincial and Trans Mountain-Edmonton terminals	7.0
Nisku to Edmonton refineries, Interprovincial and Trans Mountain-Edmonton terminals	3.0
Excelsior to Interprovincial junction Redwater-Edmonton line	6.0
Redwater to delivery facilities Redwater terminal	4.0
Tank truck loadings at Nisku and Redwater terminals	1.5
Westerose—Bonnie Glen—Glen Park—Wizard Lake to Edmonton refineries, Interprovincial and Trans-Mountain-Edmonton terminals	8.5
Joarcam North to delivery facilities at Interprovincial and Trans Mountain-Edmonton terminals	15.0
Joarcam South to delivery facilities at Interprovincial and Trans Mountain-Edmonton terminals	16.0
Duhamel to Edmonton	10.0
New Norway to Edmonton	12.0
Malmo to Edmonton	12.0
Stettler to Edmonton	15.0
Fenn Big Valley to Edmonton	18.5
Erskine to Edmonton	21.0
Clive to Edmonton	39.5
Joffre to Edmonton	39.5
West Drumheller to West Drumheller loading rack and loading on tank cars	8.5
Pembina—Buck Lake to Pembine Pipe Line main pump station	7.0
Pembina Pipe Line main pump station to delivery facilities at Interprovincial and Trans Mountain-Edmonton terminals	5.0
Tank trucks at Pembina Pipe Line main pump station to terminal tankage at the main pump station	2.5

INTERPROVINCIAL PIPELINE

To delivery points	From reception points: Redwater and Excelsior sta. (cents)	Edmonton station (cents)	Kerrobert station (cents)	Regina station (cents)	Cromer station (cents)
Edmonton station	2.0				
Milden junction	18.5	16.5	8.0		
Moose Jaw junction	23.5	21.5	12.0		
Regina station	25.5	23.5	16.0		
Souris junction	34.0	32.0	24.0	16.0	8.0
Gretna station	38.0	36.0	28.0	20.0	12.0
Sarnia township	66.0	64.0	58.0	52.0	48.0
St. Paul Park or Pine Bend, Minn., U.S.A.	46.0	44.0	38.0		28.0
Wrenshall, Minn., or Superior terminal, Wis., U.S.A.	46.0	44.0	38.0	32.0	28.0
Port Huron, Mich., U.S.A.	66.0	64.0	58.0	52.0	48.0

TRANS MOUNTAIN PIPELINE

To delivery points	From reception points: Edmonton station (cents)	Edson station (cents)
Ferndale and Anacortes	47.0	47.0
Kamloops	43.0	43.0
Burnaby	45.0	45.0
Marine terminal loading charges	2.5 cents	



UPPER CURVE shows that weight on the bit is the most important variable during coring operations. Changes in rotary-table speed have little effect on penetration rates. Fig. 1.

Careful study of reports revealed how to get . . .

Best Results From Diamond Coring

These results include: An increase in total footage from a corehead, an increase in the salvage of stones, and an appreciable rise in average rate of penetration.

by A. G. G. de Chastelain

WIDELY varying rates of penetration in the same formation and in the same field, together with considerable variations in the total footage obtained from similar coreheads, prompted a study of diamond coring* reports for the period January 1, 1952 to June 1955.

The controllable variables (Table 1) were first extracted and grouped by formations and then tabulated by r.p.m., weight on bottom, and gallons per minute (g.p.m.). Average penetration rates were then calculated for each value of r.p.m. at each value for weight on bottom in order to determine for each formation, the values of r.p.m. and weight most likely to give best penetration rate (Table 2).

Operational data were available for 45 to 140 r.p.m., 2,000 to 11,000 lb. weight, and from 75 to 420 g.p.m. While these limits extend beyond the range of most efficient operation, they provide an excellent basis for the determination of trends and of optimum conditions. As might be anticipated, the range of penetration rates was very wide (Table 3).

*All data relate to the 6⅛-in. o.d. corehead cutting a 3½-in. core—the size most commonly used in western Canada today.

TABLE 1—VARIABLES AFFECTING RATE OF PENETRATION

1. Weight.
2. R.p.m.
3. Mud volume.
4. Mud viscosity.
5. Mud pressure.
6. Pressure drop.
7. Size and type of diamonds.
8. Setting of diamonds (orientation).
9. Type and hardness of formation.
10. Stabilization of the core barrel.
11. Regularity of feed.
12. The human element.

To illustrate the method employed to establish the value of the principal operational variables for optimum performance in a particular formation, the data concerning soft and medium shales were chosen. The diagrams in Fig. 1 show the relationship between weight and penetration rate disregarding r.p.m. and separately between r.p.m. and penetration rate disregarding weight. It is evident from the former diagram, that the weight for best penetration rate is 8,000 lb. The latter diagram indicates practically a straight-line relationship between r.p.m. and penetration rate. Weight and not r.p.m. is consequently the all-important factor controlling the rate of penetration when coring in soft and medium shale and 8,000 lb. appears to be the most efficient load on a 6⅛-in. corehead. Table 4 indicates 85 r.p.m. as the optimum rotary-table

CANADA—Where Oil Is King

TABLE 2—RECOMMENDED WEIGHT, R.P.M. AND G.P.M. DURING DIAMOND CORING IN CANADA

(This applies only to a 6⅛-in. corehead cutting a 3½-in. core)

Formation—	Weight (lb.)	R.p.m.	G.p.m.
Anhydrite	8-10,000	80	200
Chert	8,000	60-70	250
Dolomite	8,000	85-95	200
Granite	8,000	50	250
Limestone	6-8,000	75-85	200
Sandstone	7,000	90	200
Shale	8,000	85	220

Recommendations for Certain Specific Formations

	Weight (lb.)	R.p.m.	G.p.m.
Cardium zone	8,000	70	240
Madison	6,000	70	250
Nisku (upper Devonian)	4-8,000	80	200
Viking	7,000	90	200

EASTMAN OIL WELL SURVEY CO. LTD.

DIAMOND CORING REPORT

L.S.D. ... S. ... T. ... R. ... W. of ... DATE ... 19...

CORE No. ... DAY No. ...

COMPANY ... CO. REP. ...

WELL NAME ... No. ... FIELD ...

CONTRACTOR ... TOOL PUSH ... RIG No. ...

PUMP MAKE ... TYPE ... LINER SIZE ... WT. IND. ...

BIT MAKE ... No. ... GAUGE ... CONDITION ...

BIT FOOTAGE START ... FEET CORED ... TOTAL FOOTAGE ...

BARREL TYPE & No. ... HOLE SIZE ... CASING ... to ... feet

DRILL COLLARS ... DRILL PIPE ... PIPE WT. ...

PUMP PRESSURE 6" OFF BOTTOM ... FEET OF RATHOLE START ... FINISH ...

MUD TYPE ... WT. ... VISCOSITY ... WT. LOSS ...

MIDNIGHT TO 8 A.M.

DEPTH START	DEPTH FINISH	TIME START	TIME FINISH	MUD WT.	VISCOSITY	WT. LOSS

8 A.M. TO 4 P.M.

DEPTH START	DEPTH FINISH	TIME START	TIME FINISH	MUD WT.	VISCOSITY	WT. LOSS

4 P.M. TO MIDNIGHT

DEPTH START	DEPTH FINISH	TIME START	TIME FINISH	MUD WT.	VISCOSITY	WT. LOSS

TOTAL HOURS ON BOTTOM		AV. MINS. PER FOOT	

CORE RECOVERY FEET ... %

FORMATION ...

REMARKS ...

STANDBY TIME ... EASTMAN OPERATOR ...

Form 137—M rev. 5-56—A.W.

THIS NEW TYPE of diamond coring report enables engineers to analyze accurately the results of diamond coring. Fig. 2.

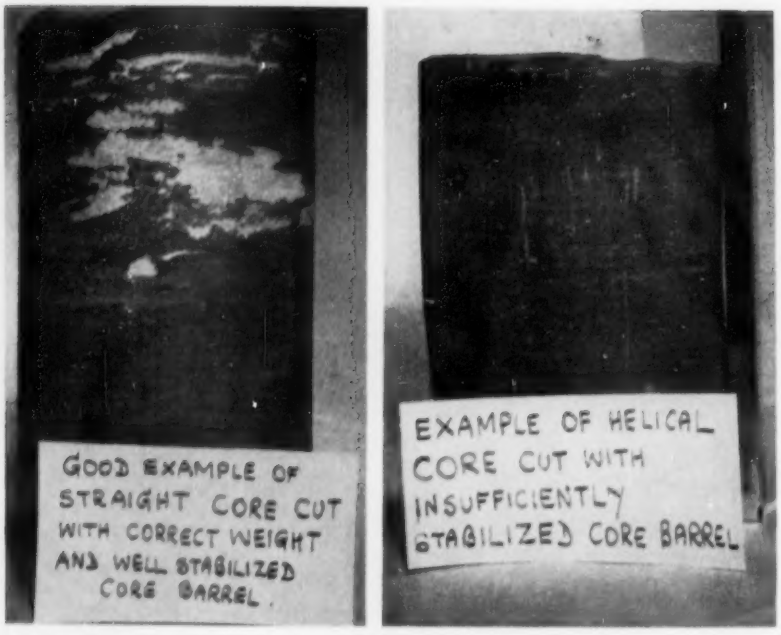
CANADA—Where Oil Is Kina

speed, with 8,000 lb. weight on the bit, (70 r.p.m. may be disregarded because relatively few feet were cored at that speed). At 85 r.p.m. and 8,000 lb. weight, the highest penetration rate obtained was 14.7 minutes per foot. The recommended weight and r.p.m. when coring in soft and medium shales are therefore 8,000 lb. and 85 r.p.m. By experimenting within limits of 10 per cent above and below these values the coring operator generally will be able to determine the best values of weight and r.p.m. in the particular shale in which he is coring.

A graph of g.p.m. against penetration covering a range of 140-340 g.p.m. showed that a rate of penetration of less than 20 minutes per foot was obtained only between the limits of 170 and 270 g.p.m. The average of these two figures, 220 g.p.m., was consequently adopted as the recommended mud volume for soft and medium shale, the tolerance of plus or minus 10 per cent being permitted.

A similar study of the coring data in the principal types of formation and

TWO VIEWS of a core cut in very hard shale during whipstock operations. Fig. 3.


GOOD EXAMPLE OF STRAIGHT CORE CUT WITH CORRECT WEIGHT AND WELL STABILIZED CORE BARREL.
EXAMPLE OF HELICAL CORE CUT WITH INSUFFICIENTLY STABILIZED CORE BARREL

LEFT PHOTO is a good example of a straight core cut with correct weight and well-stabilized core barrel. The right photo is an example of a helical core cut with insufficient stabilization of the core barrel. Fig. 4.

THE HOLE MUST BE CLEAN prior to running the diamond corehead into the hole.

in certain more commonly cored specific formations, resulted in the table of recommended operational variables contained in Table 2.

It became evident during the study that a more accurate analysis would be possible only if each of the main operational variables were recorded at 1-ft. intervals. To facilitate this, a new form of report was designed with (Fig. 2) each page covering 58 ft. which is slightly more than the average length of core normally taken. Provision also is made in this report for study of pressure drop and its relation to penetration rate. Pump pressure is recorded before coring begins and with the corehead about 6 in. off bottom. Thereafter pressure and strokes are recorded on the report for each foot cored. Since September 1955, all coring has been done within the limits shown in Table 2 and all data recorded on the more complete form of report.

The results have been an increase in total footage from a corehead, an increase in the salvage of stones, and an appreciable drop in average rate of penetration. Original recommendations have been revised twice during the intervening period and will be revised again at the end of a full year, when the effect of pressure drop in different formations will be known better.

Total footages of over 1,000 ft. are obtained in certain areas in western Canada. (Total footage increases towards the east in Saskatchewan and

TABLE 3—DIAMOND CORING-PENETRATION RATES IN CANADA
(Minutes per foot)

Formation—	Low	High	Average
D-3	29.5	6.7	13.8
D-2	45.7	6.4	15.6
Cardium	40.0	11.0	16.8
Red beds	21.9	14.3	17.7
Limestone	61.6	4.8	17.8
Dolomite	51.4	9.6	20.2
Sandstone	38.0	6.0	22.2
Anhydrite	51.4	9.1	22.7
Viking	61.2	13.4	22.8
Shale	66.0	11.5	24.9
Madison	31.8	18.6	25.2
Chert	41.3	11.1	26.5
Quartz	66.6	29.7	36.1
Granite	49.4	24.3	37.2

Over-all average obtained from over 30,000 ft. in 18.9 minutes per foot.

TABLE 4—DIAMOND CORING IN SOFT AND MEDIUM SHALES
(Recorded weight—8,000 lb.)

R.p.m.	Average minutes per foot
70	16.9
75	27.2
78	27.8
80	22.4
85	*16.9
90	20.9
95	36.9
100	24.3
110	33.5
115	19.7
118	24.7
120	22.2
130	20.5
Over-all average	23.1

*Fastest rate obtained at this r.p.m. was 14.7 minutes per foot.

THE AUTHOR

A. G. G. de Chastelain, vice president, Eastman Oil Well Survey Co., Ltd., Calgary, Alta., is a native of London, England. He took a degree in engineering at London University in 1927 and proceeded to the oil fields in Romania where he stayed until 1940. He was dropped by parachute into Romania in 1943 on a politico-military operation and as a result became persona non grata with the U.S.S.R. authorities and was barred from further entry to Romania. He joined Eastman International Co. in 1953 and has been in charge of Eastman operations in Canada since January 1955. He is analyzing directional drilling and diamond coring data with a view to establishing optimum working conditions in principal Canadian formations.

CANADA—Where Oil Is King

Manitoba and decreases towards the foothills and in North British Columbia.) An over-all average of 600 ft. seems reasonable.

The statistics of this footage are interesting. Assuming an average r.p.m. of 80, which gives a peripheral speed of 127 ft. per minute, and an average penetration rate of 20 minutes per foot, the corehead is under load on bottom for 200 hours and makes 960,000 revolutions. The average depth penetrated during one revolution is 0.0075 in. Fig. 3 shows two photographs of a core cut through the bottom and side of a rathole in very hard shale during whipstocking operations. These provide an uncommon view of the cuts made by diamonds in hard formation.

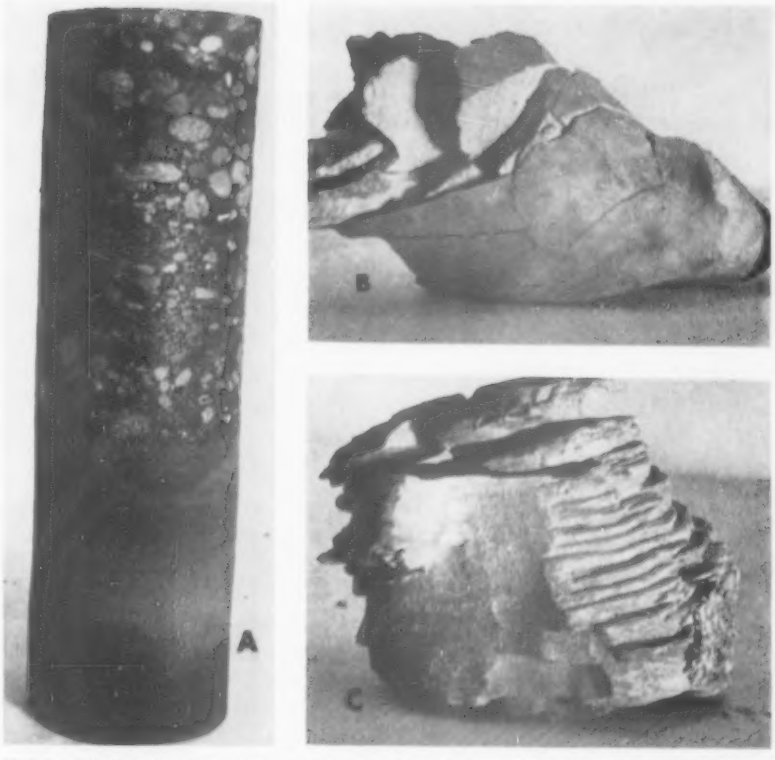
A diamond on the outside diameter of the bit travels 1,524,000 ft. or about 285 miles. In hard formations, the stone will probably pass from full to no load several times during each revolution and throughout its life will be subjected to this shock treatment several million times. It is consequently important to operate in hard formations at the lowest r.p.m. which will give a reasonable rate of penetration.

The photographs in Fig. 4 illustrate the effect of sufficient and insufficient stabilization of the core barrel.

The importance of thoroughly cleaning the hole of bit teeth, bearings, etc., can be appreciated from photographs in Fig. 5 which were taken after consecutive runs of a magnet in the same hole before diamond coring.

Fig. 6-A shows a good core of the contact between the chert conglomerate and the pay zone in the Cardium in Pembina field. One of the very troublesome formations to core in western Canada is the badly fractured Madison limestone (Fig. 6-B). Fig. 6-C is a good example of the poker-chip shale, this particular core coming from southern Alberta. Finally, the photographs (Fig. 7) illustrate a corehead after coring a better-than-average 1,000 ft. in Saskatchewan. Salvage from this corehead was 15.0 per cent.

If a general conclusion can be reached from the study which has made this short article possible, it is that a diamond corehead—the most precise of the downhole tools in oil-well drilling—amply repays a careful study of its behavior and responds to sympathetic treatment.



HERE ARE THREE of Canada's more familiar formations. A is the contact between the chert conglomerate and the Cardium pay zone at Pembina. B is the badly fractured Madison limestone, and C is the poker-chip shale. Fig. 6.

THIS DIAMOND COREHEAD cut nearly 1,000 ft. which is above average for the area. Fig. 7.

Saskatchewan's Dollard field profits from a plan of

Pressure Maintenance by Water Flood

Dollard oil field's water flood, the first for Saskatchewan, shows the results of early field-development planning. Development is on a 160-acre spacing. Plans for unitization and pressure maintenance were established only 2 years after discovery and before development was completed. Water injection, begun within 3 years of discovery, will keep pressure above bubble point.

by W. E. Perkes

DOLLARD oil field, located in southwestern Saskatchewan, Canada, was discovered in June 1953 with the completion of Tidewater Oil Co. Operator-Dollard Crown 5-21. The discovery resulted from the combined efforts of Atlantic Refining Co., Columbian Carbon Co., Ohio Oil Co., and Tidewater Oil Co., with Tidewater Oil Co. acting as operator.

Production of 23°-gravity oil was obtained from a sand and shell reservoir of Jurassic age called upper Shaunavon or J-2-A zone. A wide development-drilling spacing pattern was considered prudent by the participants so the field limits could be quickly defined and the most efficient recovery procedure determined with a minimum number of wells. The field was, therefore, developed in an orderly manner with a 160-acre spacing pattern. Fifty-two wells have been drilled to determine the field boundary and complete a 160-acre pattern, of which 40 are oil wells and 12 are dry holes. The field presently encompasses 10,200 surface acres.

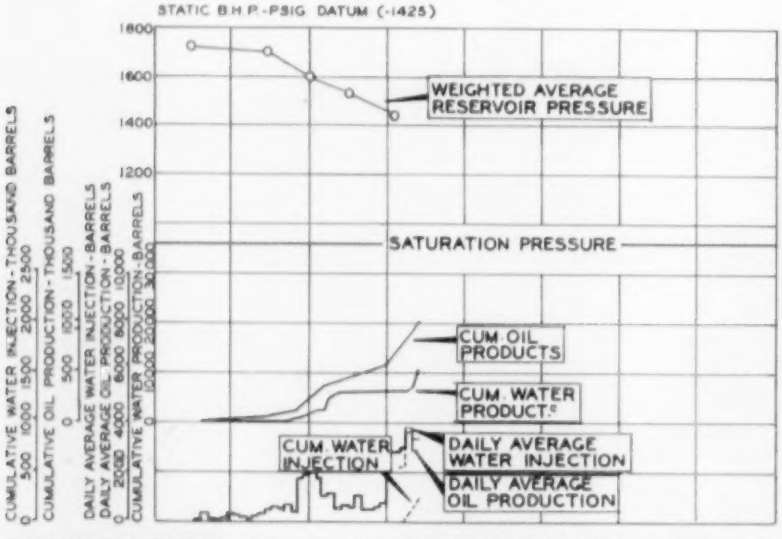
Production performance and analysis of reservoir data supported the early belief that some form of pressure maintenance would be required for efficient recovery of oil. An engineering committee, composed of engineers from the four participating companies was established to serve as consultants. Research facilities of the partners and outside consultants also were utilized to formulate the most feasible production program. Engineering studies suggested a water flood initiated early in the life of the field would be the most feasible production program.

Therefore, plans were well advanced toward unitization and pressure maintenance by water flood before the field was fully developed. Cooperation of the government and other operators in the field was excellent in setting up the recommended program. Public hearings were held by the Saskatchewan Oil and Gas Conservation Board and a plan of unit operation and a plan of primary pressure maintenance was approved on August 12, 1955.

Construction of the pressure-maintenance system was started in late September 1955. An early and very cold winter delayed completion of the injection station and laying of injection lines so that water was not injected until March 19, 1956. This is the first water-flood pressure-maintenance project in Saskatchewan and is believed to be the first unitized flood in western Canada. There are fields in Alberta and Manitoba where water is being injected for pressure maintenance, but these are not unit operations. At the time of first water injection, only 794,269 bbl. of fluid had been produced from the reservoir.

Fig. 1 illustrates production and pressure history since discovery of the field.

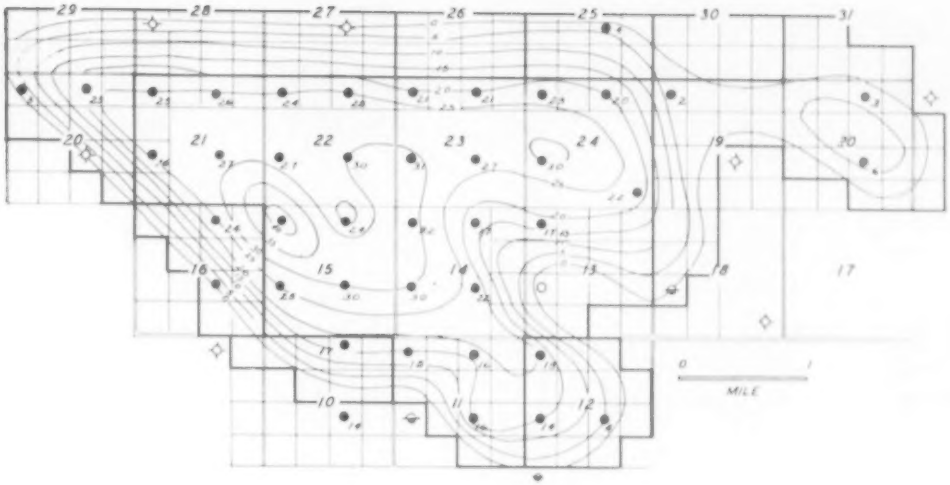
The capital cost of the pressure-maintenance project will be approximately $725,000 or equivalent to 12 completed oil wells. Injection wells with one exception have been commercial oil producers, and drilling of additional injection wells is not contemplated at this time. Engineering studies and reservoir performance have supported the initial 160-acre development pattern as a feasible spacing for producing the field by water flood. Good communication exists throughout most of the reservoir and pressure decline in shut-in wells has been very noticeable for the relatively small amount of fluid produced in offsetting wells. A potentiometric model study suggested an efficient recovery program is possible with a semi-peripheral water flood without substantial departure from the initial 160-acre well spacing. Production history during the few months that water has been injected indicates satisfactory performance. An almost immediate pressure buildup has been noted in wells offsetting the injection wells. However,



PRODUCTION HISTORY shows reservoir pressure dropping but still above bubble point. Water injection will keep pressure above this point. Scaled increments are years starting with 1953 with data up to mid-1956. Fig. 1.

CANADA—Where Oil Is King

PRODUCING



NET PAY shown by isopachous lines varies from 3 in. to 44 ft. Reservoir is a sand bar or lens grading to shale and limestone. Fig. 2.

CANADA—Where Oil Is King

the flood is still in its initial phase and satisfactory performance with respect to channeling of water must yet be proved.

The South Saskatchewan Pipeline Co. has secured a permit to lay a 59-mile, 12-in. pipeline that will connect to their system at Cantuar and permit shipping oil to market areas by pipeline.

Geology . . . Contour map of the J-2-A producing formation indicates a poorly developed anticlinal nose with a southeast plunge of 100 ft. in 5 miles. Sand and shell fragments were deposited in the form of a bar or lens which grade to impervious shale and hard, sandy limestone at the limits of the field.

The reservoir is a closed stratigraphic trap having an irregular shaped perimeter as noted on the net pay isopachous map, Fig. 2. The top of the sand is found at approximately 4,500 to 4,650 ft., varying with surface elevation and structural position. The net pay thickness varies from 3 in. in edge wells to a maximum of 44 ft. at Well 13-15, with an average reservoir thickness of 25 ft.

THE AUTHOR

W. E. Perkes is manager of production for Tidewater Oil Co. in Saskatchewan. He is a native of Utah who has been engaged in various phases of petroleum engineering since his graduation from University of Utah in 1937. From 1937-1945 he was a petroleum engineer for Tidewater at Ventura, Calif. From 1945 to 1953 he was district petroleum engineer for the firm's Los Angeles Basin district. He was appointed chief petroleum engineer for Tidewater's Saskatchewan operations in May 1953.

Wells in the northwest area of the field have vugular porosity with a predominance of lime shells interbedded throughout the sand matrix. Wells in the southerly and southeasterly section of the reservoir lack the vugular porosity. The formation is more tightly cemented and is composed of sand with a high carbonate content but having slightly lower porosity and permeability in the oil section.

The oil zone is underlain in the northerly part of the field by shale, and in the southerly part by a hard, oil-stained, sandy limestone that is nonproductive of oil. In some areas this underlying formation produces water. There are several apparently disconnected and unrelated perched water tables in the field which are believed due to isolated depressions into which water settled by gravity segregation. The water zone appears to be very thin in the isolated areas, but reaches a maximum thickness of 30 ft. in the southeastern portion of the reservoir where bottom water is more extensive and a horizontal oil-water contact is present.

Development wells . . . Development drilling consisted of setting 10¾-in. casing through glacial drift at approximately 300 ft. Wells were drilled to the top of the producing zone with a clay-base mud chemically treated to reduce water loss to approximately 6 cc. for a 30-minute test. The porous zone was cored and then tested in 5 or 10-ft. intervals. Wells were logged, using electrical log and MicroLog, with an occasional radiation log.

Seven-inch casing has been cemented through the producing zone with the float collar below the lowermost porous interval. Elapsed time from spudding to release of drilling rig averaged 14 days. Wells were subsequently completed with a service rig. Drilling mud was circulated out with water and two jet and two bullet shots per foot were used to perforate the casing. The wells were swab-tested through tubing before the running of rods and pump. Most wells have produced satisfactorily without acidizing or fracture treatment. However, in a few instances acid and fracture methods have been used with good success.

Reservoir Data

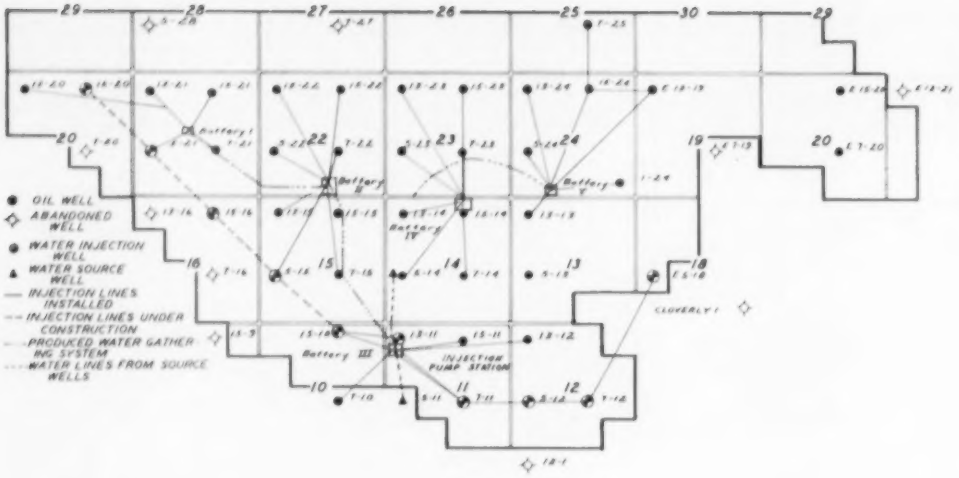
In view of the 160-acre spacing program followed, almost all wells were cored to obtain as much reservoir data as possible. Cores were sampled at 1-ft. intervals for laboratory analysis. More than 600 samples were analyzed for permeability, representing 70 per cent of the linear reservoir area exposed

TABLE 1—PERMEABILITY

	0-10 md.	10-100 md.	100-200 md.	200-600 md.	600-3,000 md.	Field average
Oil Zone						
Percentage of total (511) samples analyzed	5	18	18	33	26	523
Water Zone						
Percentage of total (108) samples analyzed	45	41	4	8	2	

TABLE 2—POROSITY OF OIL ZONE

	Per cent				Field
	0-12	12-15	15-22	22-31	average
Percentage of total (593) samples analyzed	7	9	61	23	20.4



LINE FLOODING is accomplished by injection wells along one side of the field. The whole water system is enclosed and lines are buried 8 ft. deep. Fig. 3.

CANADA—Where Oil Is King

by drilled wells. A total of 593 samples were analyzed for porosity in the oil zone and 223 in the water zone, representing 80 per cent of the exposed pay zone.

Results of laboratory analysis are summarized in Table 1, showing per cent of samples within the ranges of permeability and porosity noted.

There appears to be no connected channels of high or low permeability between wells within the pay zone as shown in Table 2.

Residual oil saturations vary between 3 and 41 per cent, but 46 per cent of the samples range between 18 and 28 per cent. The field average is 28 per cent.

Interstitial water initially was determined by the restored state and evaporation methods and corrected for capillary effect. Average interstitial water was determined to be 18 to 21 per cent. Later research studies indicated the possibility of an oil-wet reservoir rather than a water-wet reservoir. Two wells were cored with water-free crude oil and average residual water content was found to be only 5 per cent.

Two bottom-hole crude samples have been taken and results are summarized as shown in Table 3.

TABLE 3—RESULTS OF BOTTOM-HOLE CRUDE SAMPLES

	Dollard 7-21	Dollard 1-24
Original reservoir pressure, psig.	1,711	1,711
Saturation pressure, psig.	917	984
Formation volume factor, oil per reservoir bbl.	1.099	1.078
Reservoir temperature, °F.	140	137
Viscosity of reservoir oil at original conditions, cp.	8.25	10.20
Viscosity of reservoir oil at bubble point, cp.	7.60	9.61
Dissolved gas-oil ratio, cu. ft. per bbl.	138	125
Stock-tank oil gravity, °A.P.I.	23	23
Sodium chloride content of producing-zone water, p.p.m.	11,000	

Water-Flood Study

A potentiometric model study was made as soon as the limits of production had been reasonably well established to determine the most efficient method of flooding the reservoir and the proper location for injection wells. Results of the model study indicated a favorable line flood could be obtained by the conversion of approximately 10 wells to injection wells along the southeast and southwest perimeter of the field (Fig. 3). This would permit flooding at an initial rate of 15,000 reservoir barrels per day (13,650 stock-tank barrels per day) without substantial departure from the existing 160-acre well spacing. However, production at this rate would be, at best, temporary since production must decline as wells are invaded by water.

Consideration also has been given to other recovery methods and injection patterns. The present pattern permits considerable flexibility for future operations since the injection wells would fit into a pattern flood if such a change were considered advisable.

In view of the relatively high oil viscosity and the presence of bottom water in some areas, flooding cannot be accomplished without the production of large volumes of water. The injection system has been designed to permit cycling large volumes of water which will be produced with the oil.

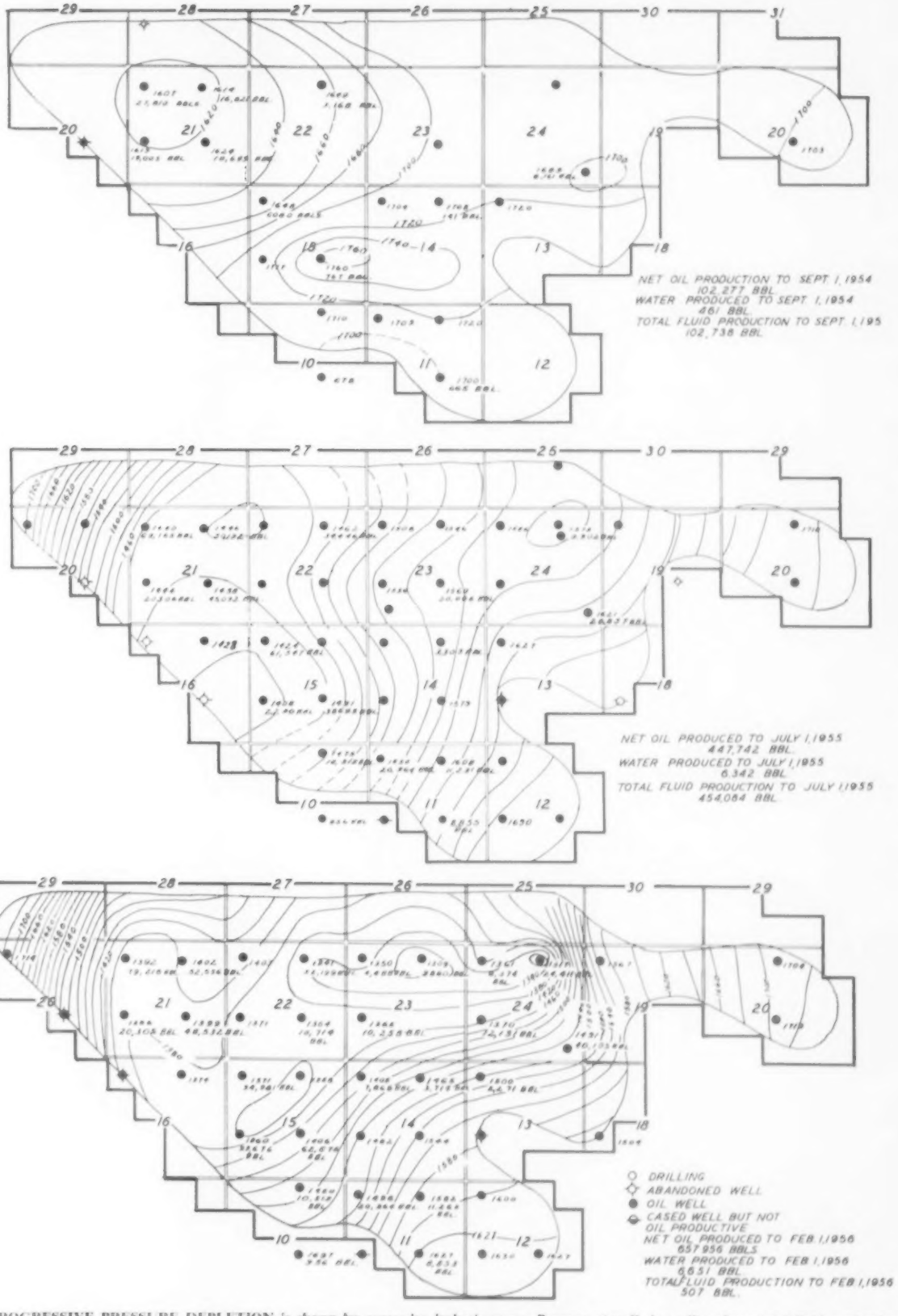
Pressure performance . . . Even when reservoir oil is replaced by equivalent volumes of water, pressure will decline at the producing wells and rise near the injection wells until sufficient pressure differential is built up across the reservoir to effect the movement of the fluids at the producing rate or injection rate. At that point the pressure should stabilize.

It is desirable to prevent further increase of viscosity of oil by loss of solution gas, so pressures in the vicinity of farthest producing wells will be maintained above the bubble point of 917 psi. insofar as possible.

Overinjection of water in the amount of 1.8 million barrels should increase the reservoir pressure an average of 1,000 psi. above the initial pressure of 1,711 psi. and permit flowing most wells even with a high water cut. Water is being injected at approximately twice the oil production rate to achieve the desired reservoir performance within a reasonable period of time.

The next important consideration in selecting the location of water injection wells arises from the fact that some areas are underlain by water. A producing well completed over bottom water may produce with a high oil-water ratio. Any attempt at water exclusion may lead to coning and might impair the productivity of the well without any substantial long range reduction in water-oil ratio.

To prevent entry of oil into space now occupied by water, water injection wells have been located in the areas underlain by water, as far as possible. With 10 injection wells, the maximum pressure distribution across the reservoir should be approximately 2,400 psi. if a production rate of 13,650 stock-tank barrels per day and an equivalent injection rate of 15,000 bbl. water per day were maintained. At lesser rates


NET OIL PRODUCTION TO SEPT. 1, 1954
102,277 BBL.
WATER PRODUCED TO SEPT. 1, 1954
461 BBL.
TOTAL FLUID PRODUCTION TO SEPT. 1, 195
102,738 BBL.
NET OIL PRODUCED TO JULY 1, 1955
447,742 BBL.
WATER PRODUCED TO JULY 1, 1955
6,342 BBL.
TOTAL FLUID PRODUCTION TO JULY 1, 1955
454,084 BBL.
DRILLING
ABANDONED WELL
OIL WELL
CASED WELL BUT NOT OIL PRODUCTIVE
NET OIL PRODUCED TO FEB. 1, 1956
657,956 BBLS.
WATER PRODUCED TO FEB. 1, 1956
6,651 BBL.
TOTAL FLUID PRODUCTION TO FEB. 1, 1956
507 BBL.

PROGRESSIVE PRESSURE DEPLETION is shown by successive isobaric maps. Pressure at wells is on line above total fluid production. Some wells have not been produced. Fig. 4.

TABLE 4—OWNERS AND PARTICIPATING INTEREST

Working interest owner—		Participating interest
Frontier Refining Co.		3.8530
Hudson's Bay Oil & Gas Co., Ltd.		1.7138
Fargo Oils, Ltd.		0.6703
Tidewater Oil Co. group—operator for:		
Tidewater Oil Co., 30 per cent	28.12887	
Ohio Oil Co., 30 per cent	28.12887	
Atlantic Refining Co., 20 per cent	18.75258	
Columbian Carbon Co., 20 per cent	18.75258	93.7629
Total		100.0000

of production, this pressure drop will be correspondingly reduced.

Isobaric maps (Fig. 4) indicate reservoir conditions at three stages prior to water injection. A number of observation wells have not been produced and comparison of pressure data indicates communication between wells with resultant pressure drop at the shut-in wells.

Unitization

Unitization of the field was necessary to set in operation a pressure-maintenance program. As stated above, a plan of unit operation and a plan of primary pressure maintenance was approved by the minister in August 1955. The plan provided that each operator's equity would be determined by the percentage of acre-feet of net pay present under each tract. The working interest owners and the corresponding participating interest are summarized in Table 4.

Production and Injection System

Location of tank batteries and production equipment required careful consideration in view of winter weather conditions that prevail in the province. It is not uncommon to have many weeks of 20° below zero weather with occasional temperature drops of 35° to 50° below. Strong winds pile deep snow drifts on lease roads and production operations are at times seriously hampered unless operations are consolidated at a minimum number of conveniently located batteries.

There are a total of five batteries in the field. Locations have been selected so each battery can service wells in approximately two sections. Batteries have been located along the main lease roads to reduce winter snow removal.

Individual 3-in. flow lines are buried 5½ ft. deep from the well to a separator house. Manifolding inside the separator house permits directing oil from each well to a test separator, a community separator for clean oil, or a community separator for wet oil. Additional manifolding permits directing the wet oil into a 10-ft. treater and wells on test production to a 6-ft. treater. Clean oil from the treaters or from the clean wells can be directed to any one of six 1,000-bbl. storage tanks by manifolding within the separator house.

In anticipation of increasing reservoir pressure by pressure maintenance, so the wells will flow, provision for flow beans has been incorporated in the manifold design so wells may be shut in or regulated at the separator house without travel to the individual wells. The separator houses are insulated but not heated. The only difficulty experienced so far is the occasional freezing of the orifice in the gas meter. Injection of small quantities of alcohol in the gas line ahead of the orifice meter has solved this problem.

Injection-system design . . . The injection system was designed so the following could be achieved:

1. Minimum operating labor.
2. Maintenance of a closed system at all times.
3. Segregation of produced water from the source well water.

These objectives have been successfully incorporated in the system.

Injection station . . . The injection station is located at Tank Battery 3 so one group of operators can care for both the injection station and the tank battery. The site is almost centrally located between the two extreme injection wells, and block valves are installed so that produced water may be injected in one direction away from the injection station and source water in the other direction.

Four triplex pumps, each capable of handling 2,000 bbl. per day at 2,500 psi. discharge pressure, are presently installed. These are operated by 100-hp. electric motors. Two additional pumps will be installed with enlargement of the system which is presently under construction.

Skim tank for removal of oil from produced water and filters for both produced water and source water are housed within the injection station. Filters are manifolded so that either produced water or source water may be filtered without commingling.

The accumulator tanks for the source water and produced water contain U-tube, gas-fired heaters for emergency use if heat is required to prevent freezing around the liquid-level controls. Tanks can be drained if a prolonged shutdown is anticipated. The backwash tank is a cone-bottom tank and the drain line has sufficient fall to the flare pit that freezing is minimized. Building is heated with gas heaters and operations so far have been successful under extreme subzero temperature conditions.

CANADA—Where Oil Is King

Source water . . . Water is being obtained from a water well completed in the Viking and lower Blairmore zones of Cretaceous age, with casing perforated at selected intervals between 3,840 and 4,335 ft. These zones are not oil or gas bearing in the field and produce water of approximately 8,000 p.p.m. chloride salinity. A 72-stage Reda pump is set at 2,000 ft. Static fluid level of the water well is 800 ft. and annulus fluid level (while pumping 6,000 bbl. per day) is 1,215 ft.

A second water well is presently being completed 1 mile north of the present well to provide sufficient water for anticipated future requirements.

Water segregation . . . Laboratory tests suggest that the source water and produced water are compatible, but production experience in water flooding indicates commingling of waters from different zones in constantly varying proportions sometimes requires chemical treatment and settling ponds. The long cold winters present operating difficulties if chemical treatment and settling ponds are required, therefore segregation of waters was considered prudent.

Additional flexibility has been achieved for handling small quantities of produced water by use of flow lines as injection lines to three of the injection wells. These will be used for injection of small volumes of produced water while the reservoir is being repressured and until the volume of produced water is sufficient to justify using half the injection system for returning produced water to the formation.

Injection lines . . . The injection lines are 6⅝-in., 28.57-lb. and 4½-in., 13.98-lb. seamless line pipe which were cement-lined in the field, leaving a ½-in. gap of cement at the end of each joint. The joints were welded, then a cement mandrel was used to fill the void at each joint. All bends were made with flanged fittings which were cement lined so that a continuous cement lining exists throughout the buried portion of the system. The injection lines were externally coated with polyethylene tape and asphalt felt for external corrosion control before burial in the trenches.

In this part of Saskatchewan it is not

unusual to have frost penetration of 7 to 8 ft. during the more severe winters. The injection lines were laid in 8-ft. trenches to minimize freezing in the event of power failures or other operational breakdowns. When the pressure-maintenance system is fully completed, there will be approximately 8 miles of injection lines.

The risers from the injection line to the wellhead are 3 in., inside 12-in. casing. The annulus has been filled with insulation to minimize freezing of the riser when injection wells are shut in for observation purposes. An oil blanket is maintained between the tubing and 7-in. casing at each injection well so the annulus will not stand full of water and freeze.

Produced water . . . Produced water will flow by gravity through 6-in. transite lines from four of the five batteries to a conveniently located concrete accumulation pit near Battery 2. The pit was constructed below ground level with a pump room adjacent to the pit. The structure was covered with an insulated roof and an oil blanket will be maintained on the water. A float-controlled pump will pump the water to the injection station skim tank through a cement-lined pipe. Produced water from Battery 3 is forced to the skim tank by means of a gas-operated blow case. The transite lines are all buried a minimum of 8 ft. deep.

Controls . . . Instruments installed to simplify operation of the injection station are located on an instrument panel in the office.

Panel instruments indicate differential pressure across the filters; temperature and water level in the accumulator tanks; gas pressure in the skim tank and accumulator tanks, and recording pressure gages for all water leaving the plant. Water entering the plant is controlled by throttle valves activated by liquid-level controls on the accumulator tanks.

Warning lights and safety switches will stop the pumps under several undesirable but possible operating conditions. In the event of power failure, all pumps will automatically start when power is restored; however, relays will prevent simultaneous starting of equipment. These various controls allow automatic operation with minimum supervision, and will permit operators to care for the nearby tank battery.

Initial Flood Performance

On March 19, 1956, the project was set into operation by injecting water into four wells, Dollard Crown 15-10, 7-11, 7-12, and 5-18. Average daily water-injection rate was approximately 4,000 bbl. until May 24 when injection rate was increased to approximately 5,800 bbl. per day. Oil production is presently 3,000 to 3,500 bbl. per day, but will be increased to 5,000 bbl. per day with completion of the injection system extension.

Injection wells have been tested at various rates and pressures. These tests suggest that 7,500 to 8,000 bbl. per day could be injected into the present injection wells without exceeding 2,500 psi. discharge pressure. Further data relating to the injection wells are summarized in Table 5.

Performance of No. 7-11 has not been as satisfactory as the other injection wells, but continued injection may break down the formation.

As of July 1, 1956, a total of 416,265 bbl. water has been injected into these four wells. During this same period 330,594 bbl. of oil and 6,946 bbl. of water have been produced from the field. Overinjection of 45,320 bbl. has been achieved during this period, considering a formation volume factor of 1.099 and neglecting compressibility of water.

Water is being produced from the water source well at 135° F. and is being injected at the most remote well at 92° F. Injection temperature of water undoubtedly will be considerably less during winter operations.

Pressure response in wells offsetting the injection wells has been rapid with a maximum increase of 290 psi. noted in Dollard Crown 5-12. Pressure effect noted in observation wells is summarized in Table 6.

Even though the flood is still in its initial phase and insufficient history is available to fully evaluate its probable success, all data to date are encouraging. No mechanical or reservoir problems have been encountered since operations started that would suggest the project will not operate satisfactorily as presently engineered.

TABLE 5—DATA ON INJECTION WELLS

Well	Porous interval (ft.)	Avg. core perm. (cp.)	Avg. daily water injection (bbl.)	Injection pressure (psig.)	Present injection capacity per ft. of sand (bbl.)	Present injection capacity per psi. (bbl.)	Capacity per foot per psi. (bbl.)
15-10	25	135	2,480	1,740	99	1.42	0.0568
5-18	6	1,080	1,590	1,270	265	1.25	0.208
7-11	24	1,040	810	1,290	34	0.63	0.0262
7-12	34	327	1,910	1,280	56	1.49	0.0438

TABLE 6—PRESSURE EFFECT IN OBSERVATION WELLS

Well—	Last pressure survey before water injection		Pressure surveys since water injection		Gross fluid produced between survey dates (bbl.)
Dollard 13-11	Feb. 13, 1956	1,498 psi.	April 6, 1956	1,512 psi.	Nil
			May 15, 1956	1,523 psi.	5,856
			May 30, 1956	1,572 psi.	Nil
			June 14, 1956	1,591 psi.	Nil
			June 27, 1956	1,600 psi.	Nil
			July 11, 1956	1,616 psi.	Nil
			July 28, 1956	1,632 psi.	Nil
Dollard 15-11	Feb. 23, 1956	1,582 psi.	April 6, 1956	1,572 psi.	Nil
			July 3, 1956	1,530 psi.	15,182
Dollard 5-12	Mar. 3, 1956	1,630 psi.	April 12, 1956	1,663 psi.	Nil
			April 27, 1956	1,692 psi.	Nil
			May 4, 1956	1,709 psi.	Nil
			May 17, 1956	1,739 psi.	Nil
			June 1, 1956	1,779 psi.	Nil
			June 14, 1956	1,862 psi.	Nil
			June 26, 1956	1,920 psi.	Nil
			July 12, 1956	2,002 psi.	Nil
			July 28, 1956	2,084 psi.	Nil
Dollard 13-12	Feb. 13, 1956	1,600 psi.	April 26, 1956	1,582 psi.	Nil
			May 3, 1956	1,573 psi.	Nil
			May 16, 1956	1,596 psi.	Nil
			May 30, 1956	1,603 psi.	Nil
			June 14, 1956	1,616 psi.	Nil
			June 27, 1956	1,632 psi.	Nil
			July 11, 1956	1,673 psi.	Nil
			July 27, 1956	1,720 psi.	Nil
Dollard 5-15	Mar. 21, 1956	1,337 psi.	June 28, 1956	1,290 psi.	12,287
			July 21, 1956	1,289 psi.	5,189
Dollard 7-15	Feb. 4, 1956	1,406 psi.	May 16, 1956	1,389 psi.	21,526
			June 15, 1956	1,406 psi.	Nil
			July 12, 1956	1,399 psi.	1,014
Dollard 1-24	Feb. 21, 1956	1,472 psi.	April 3, 1956	1,436 psi.	1,232
			April 30, 1956	1,440 psi.	Nil
			June 2, 1956	1,447 psi.	Nil
			July 6, 1956	1,460 psi.	935
			July 27, 1956	1,471 psi.	2,753

CANADA—Where Oil Is King

Fluid Fracturing Boosts Manitoba Activity

Producing formations are from 2,300 to 2,700 ft. deep. Daly area wells respond best to a treatment of about 10,000 lb. of sand mixed in oil in concentrations of about 1 to 3 lb. per gallon. In the open-hole completions, fractures tend to be vertical and extend downward.

by H. Welner

THE first commercial oil in Manitoba was found at California Standard Daly 15-18 well which was completed early in 1951. Following this discovery, development drilling progressed slowly because of the limited success of existing completion techniques in low-permeability limestones.

With the introduction of the fluid-fracturing technique, however, activity increased considerably in 1955 and 1954. By the end of 1955 approximately 550 wells were completed in Manitoba, and oil production was approximately 14,000 bbl. per day.

Most of this production comes from the Daly area which includes Daly, East Cromer, and Woodnorth fields, and from the Virden area which includes North Virden and Virden-Roselea fields (Fig. 1).

To date all production in Manitoba is from the Mississippian.

Author is with California Standard Co., Calgary, Alta.

Drilling Techniques in the Daly-Virden Areas

The Mississippian producing horizon in the Daly area is found at 2,300 to 2,700 ft. and in the Virden area is found at approximately 2,000 ft. Development drilling is being done by portable or trailer-mounted rotary rigs suitable for these drilling depths. (See schematic cross-section, Fig. 2.)

Drilling operations in both areas are straightforward, with no problems such as loss of circulation or excessive hole deviation. Drilling procedures in both areas can be summarized as follows:

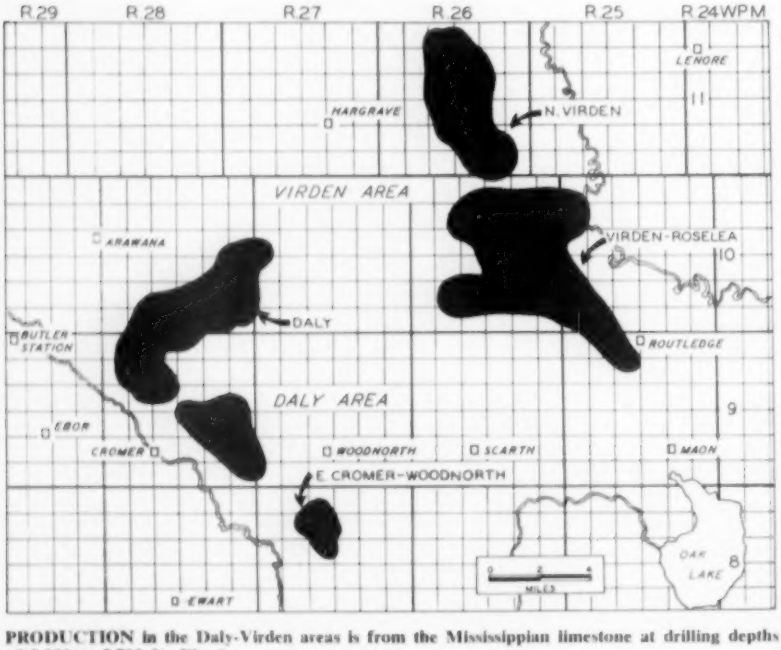
Surface pipe is landed 100 ft. below true shale contact, but a minimum of 300 ft. of surface pipe is required (Manitoba Conservation Board order). Usually 9⅝ in. or 10¾-in. surface pipe is run in a 13¾-in. hole, and cemented to surface using neat cement with 2 per cent calcium chloride. After 18 hours of waiting on cement, the surface pipe is slacked off, blowout preventers are nippled up and tested.

The glacial drift varies from 100 to 300 ft. in thickness in the two areas, and consists of sand and gravel. However, fair-sized boulders are present in the lower part of the drift. For this reason a pilot reamer is run above the full-hole bit to keep the surface hole straight and at its correct gage in the lower part of the drift.

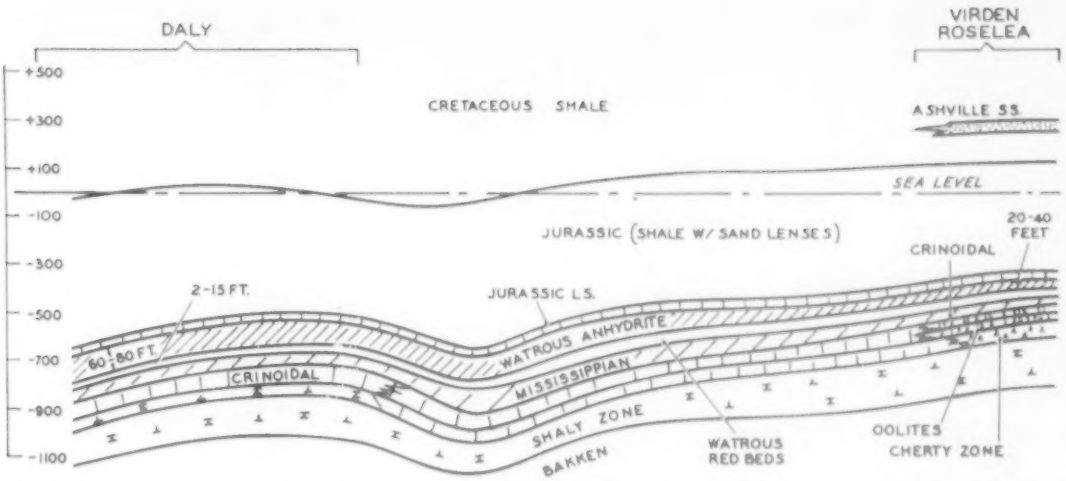
Approximately 24 hours after surface pipe is cemented, drilling is continued in 8¾ or 9-in. hole using a 10.1-10.4-lb. per gal. straight-gel mud treated with phosphate. At a point approximately 150 ft. above the top of the pay (depth 2,00-2,400 ft.) a change-over to gyp-based mud is made to drill through the watrous anhydrite.

The 8¾ or 9-in. hole is carried to the top of the producing section. The producing section is then diamond cored in 6⅛-in. hole and conventional logs are run.

Drill-stem testing . . . Drill-stem tests in the Daly area are of little significance, and are seldom used for purposes of evaluation. The low permeability of the producing section in this area



PRODUCTION in the Daly-Virden areas is from the Mississippian limestone at drilling depths of 2,000 to 2,700 ft. Fig. 1.



SCHEMATIC CROSS-SECTION through Daly and Virden-Roselea. Notice that the fields are covered by 100 to 300 ft. of glacial drift. Fig. 2.

CANADA—Where Oil Is King

makes drill-stem-test results unreliable and not necessarily representative of well potential.

In the Virden area, where parts of the pay show better reservoir characteristics, drill-stem tests are more frequently run. Rathole packers as well as full-hole packers are used without difficulty.

After deciding on the completion-stimulation methods for a development well, the casing point is selected and usually 7-in. casing is run. However, 5½ or 6⅝-in. pipe has been used depending on older types of completion methods and shortages of 7-in. pipe.

To drill, core to total depth, and run the production strings of casing will take approximately 7 to 9 days in the Daly area and 5 to 6 days in the Virden area. The number of days varies with the amount of coring to be done and the amount of anhydrite to be penetrated.

Daly Area

Lithology . . . The Mississippian productive section may be subdivided into the following units: (Fig.3).

1. Dolomite-anhydrite (30-40 ft).
2. Middle limestone (30 ft.) This unit is potentially productive where stained sections are sufficiently developed.
3. Crinoidal limestone (55 ft.)—The top 25 ft. of this unit (referred to as first crinoidal in this article) consist of fine crystalline limestone with interbeds of crinoidal limestone. The lower 30 ft. (referred to as main crinoidal) consist of interbedded crinoidal and shaly limestone.
4. Cruickshank crinoidal (2-50 ft.)—This unit is immediately below a thin shaly member (Cruickshank shale) which underlies the main crinoidal. The Cruickshank crinoidal is generally 2-8 ft. thick, but in some areas of Daly field it develops rapidly up to thicknesses of 45 to 50 ft.

These units are underlain by a shaly limestone which has proved oil productive in the East Cromer area only. In this area it contains natural fractures and vuggy porosity.

Porosity ranges from 6-14 per cent, averaging 9 per cent; permeabilities range from .01 to 400 md., averaging about 5 md.

Completion methods . . . Completion methods may be classified as follows:

Method 1. Production string set at the top of the Mississippian section, exposing first three units in open hole.

Method 2. Production string set at top of the main crinoidal, exposing the main crinoidal to open hole.

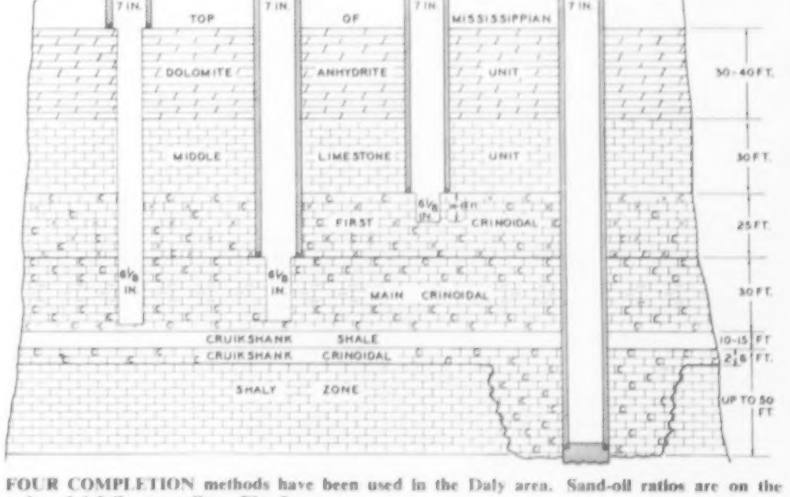
Method 3. Production string set at the top of the first crinoidal with 10-15 ft. of 6⅛-in cored rathole exposed below the casing shoe.

Method 4. Cased through hole.

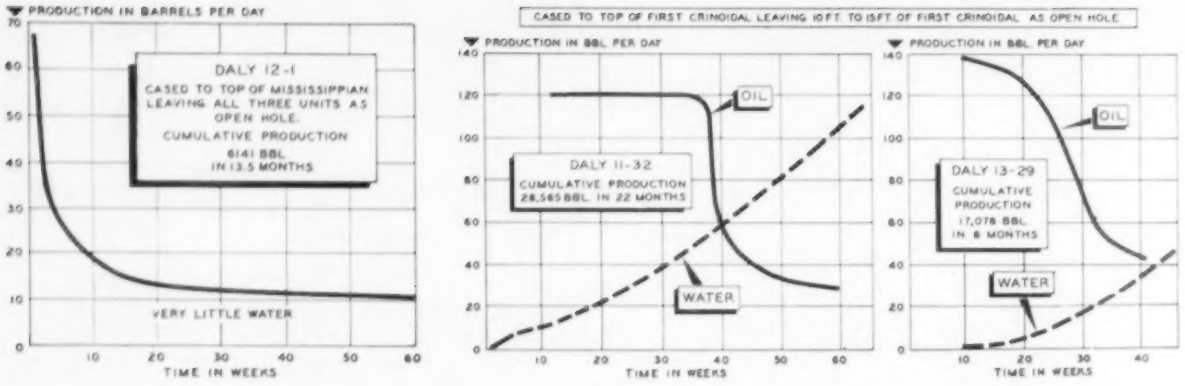
Prior to 1954, when completion Method 1 predominated (Fig. 3), commercial production was obtained only in those parts of the field where natural fractures and high-permeability streaks were relatively numerous. Attempts to stimulate productivity by such methods as shooting, acidizing, acidfrac, and hydrafac met with only limited success.*

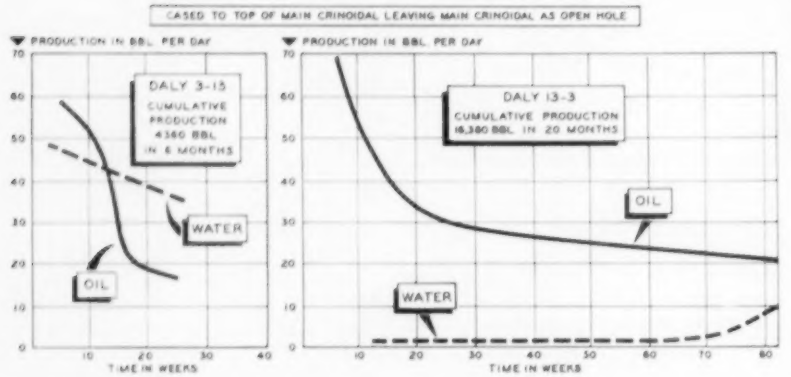
With the introduction of the more successful hydrafrac process, drilling in Daly field was stepped up. The experience gained from the additional completions led to the development of

*See "Completion Practices in Southwestern Manitoba" by J. G. Trowell and D. T. Magee, C.I.M. Bul., March 1953.



FOUR COMPLETION methods have been used in the Daly area. Sand-oil ratios are on the order of 1-3 lb. per gallon. Fig. 3.





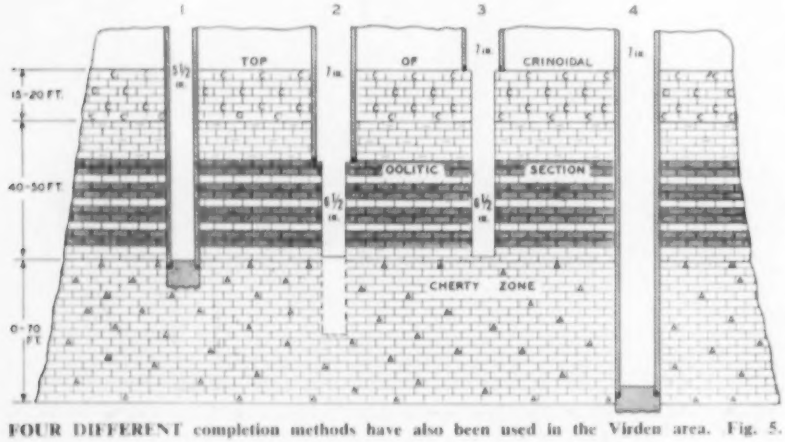
a sand-oil technique which particularly suited the Daly-type reservoir. The sand-oil technique uses Daly crude as the carrying agent and sand as the propping agent.

During 1953, wells completed as mentioned under Methods 1 and 2 responded moderately well to sand-oil treatment, but results were still unsatisfactory.

Early in 1954, completion Method 3 was adopted in Daly field. This method has proved to be a successful way of completing wells in Daly field, and has resulted in approximately 15 initial flowing wells in the southwest part of the field. These particular wells are further subject to an active edge-water drive and have been found capable of flowing for periods of 4 to 6 months before going on pump.

Trend of production . . . Production history in Daly field has been characterized by various types of decline curves. These decline curves can be correlated to a certain extent with the previously mentioned completion methods, (Fig. 4).

Under completion Method 1, Daly 12-1 shows the characteristic decline of this type of completion—high initial production, rapidly declining to a low production rate and very little water.



FOUR DIFFERENT completion methods have also been used in the Virden area. Fig. 5.

DECLINE CURVES can be correlated to a certain extent with the completion methods shown in Fig. 3. Fig. 4.

CANADA—Where Oil Is King

This well has produced 6,141 bbl. in 13½ months, indicating a very slow payout.

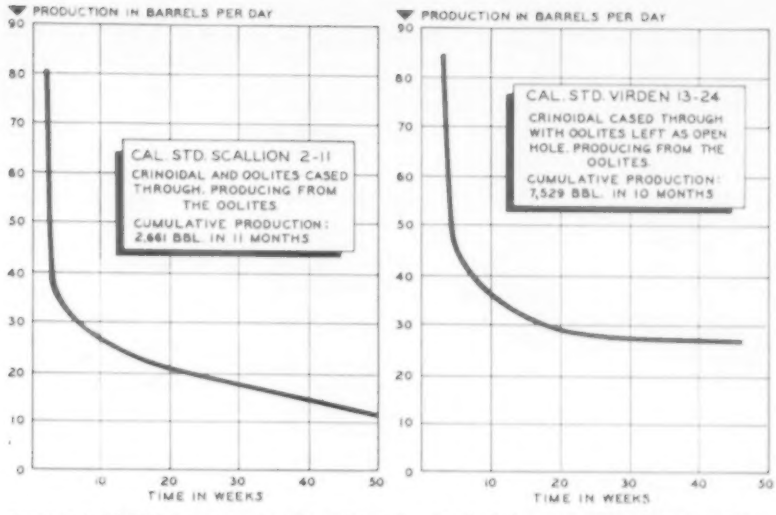
Under completion Method 2, Daly 3-13 and 13-3 indicate two different types of decline curves. Daly 13-3 shows a considerably better decline curve than Daly 12-1. After a rapid decline the well levelled out at a higher production rate. However, the water-oil ratio has been increasing steadily after 1 year of fairly clean production. This well has produced 16,380 bbl. of oil in 20 months.

Daly 3-13 shows a very high initial water-oil ratio. Oil production is seen to decline at approximately the same rate as in Daly 13-3, but has levelled out at a much lower rate within a shorter period of time. The well has produced 4,360 bbl. of oil in 6 months.

Under completion Method 3, the general character of the decline curves changed significantly with the introduction of first crinoidal completions. A great number of wells in Southwest and Northeast Daly were completed in this way during 1954 and 1955. Production decline curves in both areas appear to indicate the same initial results. Nearly all of these wells show the same characteristic decline, and Daly 11-32 and Daly 13-29 are typical examples.

Daly 11-32 showed a steady production of 120 bbl. of relatively clean oil per day for the first 6 months. A rapid decline of oil production to 30 bbl. per day coincided with a rapid increase in water cuts over the following 6 months. This well produced 28,565 bbl. of oil in 12 months.

Daly 13-29 is very similar, with the exception of a slower decline. Daly 13-29 has produced 17,078 bbl. of oil in 8 months.


PRODUCTION IN BARRELS PER DAY
CAL. STD. SCALLION 2-11
CRINOIDAL AND OOLITES CASED THROUGH. PRODUCING FROM THE OOLITES.
CUMULATIVE PRODUCTION: 2,661 BBL. IN 11 MONTHS
TIME IN WEEKS
PRODUCTION IN BARRELS PER DAY
CAL. STD. VIRDEN 13-24
CRINOIDAL CASED THROUGH WITH OOLITES LEFT AS OPEN HOLE. PRODUCING FROM THE OOLITES.
CUMULATIVE PRODUCTION: 7,529 BBL. IN 10 MONTHS
TIME IN WEEKS

DECLINE CURVES indicate that the well on the right had the more successful type of completion. Fig. 6.

This type of completion has considerably improved the economic picture in Daly field.

Development of Method 4 . . . Comparing the above decline curves, it is evident that the short open-hole completion in the first crinoidal is the most satisfactory of the first three methods.

However, this type of completion has disadvantages which are:

1. Only a short section of the pay is opened up.

2. Effect of fracturing is more vertical than horizontal. Proof of this was established by coring ahead into the main crinoidal after fracture treatment. Artificial sand-filled vertical fractures were evident right into the main crinoidal.

3. Attempts to shut off water might be difficult because of water influx right to the top of the pay zone.

4. Reworks will be costly because these wells would have to be deepened.

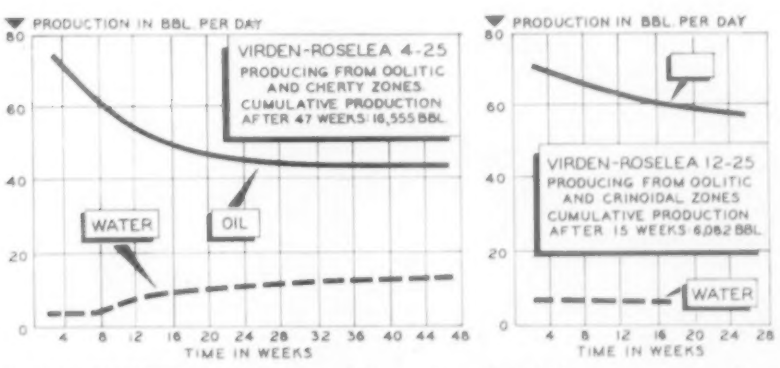
Because of these reasons it is advantageous to drill and case through the complete producing section.

For some time the technique of casing-through was not favored because of cement failures when attempts were made to selectively treat adjacent zones of opposite characteristics in Virden area wells. Subsequently, improvements were made in the technique of cementing production casing. Practice is now to wash the formation ahead of the cement and use neat or posmix cement opposite the pay sections. (See Fig. 1.)

A number of Daly wells have been cased-through and selectively fractured through perforations in the main crinoidal or Cruickshank crinoidal where present. Results have varied from very good to poor. However, no conclusions should be made until these wells have been reworked or treated in the upper portions of the pay section.

The sand-oil technique used in first crinoidal completions is straightforward in its application.

The plug and cement are drilled out after 48 hours waiting on cement and the open hole is circulated for 2 hours with water to clean out filter cake. Tubing (2 or 2½ in.) is run in and the hole



WELLS COMPLETED in two zones are better producers than single-zone completions. Compare these curves with those in Fig. 6. Fig. 7.

displaced with oil. Packer or squeeze tools are not essential. However, in cases where high breakdown pressures are anticipated, the additional use of packers, squeeze tools, hydrochloric acid, or open-hole perforating is recommended to safeguard the casing and the primary cement job. The breakdown of the formation is usually established with one high-pressure pump and the sand-oil mixture is displaced with two high-pressure pumps. The sand-oil mixture is flushed with 10-30 bbl. of crude oil.

Generally 10,000 lb. of sand is used. This sand consists of 1,000 lb. of 45 mesh sand ahead of 9,000 lb. of 20 mesh sand. Flowback of sand to well bore does not occur in Daly field. Larger quantities of sand have been used, but did not indicate better results.

Breakdown pressures vary from 2,500-4,500 psi. Feeding pressures with sand-oil are in the order of 2,000-4,000 psi., averaging about 2,700 psi. Sand-oil ratios are from 1-3 lb. per gal., depending on how much the formation will take. Feeding rates are from 3-8 bbl. per minute.

After the well has been treated, the total oil which has been used is recovered and the well put on a 5-8 hour production test. If the results are satisfactory, the well is then placed on production.

Methods of well stimulation . . . East Cromer and Woodnorth fields extend from the southwest part of Daly field in a southeasterly direction as indicated on the map (Fig. 1). Use of hydrochloric acid for well stimulation is the currently accepted practice in this area. Sand-oil treatment is usually not necessary in these two fields because of the presence of vertical fractures and wide-open porosity. These fractures extend even to Daly field. Daly 1-29, for instance, was swabbed into production without any other form of stimulation.

Acid treatment, using 500-750 gal. of mud acid and regular acid, is sufficient in East Cromer and Woodnorth. The acid is washed across the pay zone for 30-45 minutes. Vehy seldom is acid squeezed into the pay section, but if it is, then only in small quantities. The acid is reversed out and the well will usually produce without further stimulation. Woodnorth wells have consistently produced their daily allowables since being placed on production.

Lithology

The productive Mississippian section may be divided as follows: (Fig. 5).

1. Upper dolomitic unit (40-90 ft.)
2. Crinoidal limestone (15-20 ft.)

which generally contains less shale than it contains at Daly.

3. Oolitic limestone section (40-50 ft.) consisting of four main bands of oolitic limestone (each band approximately 3 ft. thick) interbedded with shaly limestone. A fifth band known as fragmental zone is usually included in the cherty zone because of its lack of distinction.

4. Fine crystalline limestone (called cherty zone) with a stained and potentially productive thickness varying from 0-70 ft.

Porosities in the crinoidal, oolitic, and cherty zones average 9.8 per cent, 12.2 per cent, and 13.1 per cent respectively. The permeabilities in the oolitic and cherty zones range from 2 md. to hundreds of darcies, whereas the crinoidal zone is tight, with permeabilities comparable to Daly.

Because of the three adjacent zones of opposite characteristics a combination of completion techniques has been employed. The following, in chronological order, are the methods of completion that developed with the development of the area:

Method 1—Production string set through crinoidal and oolitic pay section.

Method 2—Production string set at the top of oolitic section.

Method 3—Production string set at the top of crinoidal.

Method 4—Production string set entirely through pay section.

Method 1 was used in the early stage of development in Roselea and Scallion fields (little was known at that time of the cherty zone).

The oolitic zones require acid treatment only for stimulation, because of better porosity and higher permeability in comparison to the crinoidal zone. After casing was set through, radioactivity logs were run and the entire thickness of each oolitic zone was perforated in one run. After perforating, each zone was selectively acidized with 150-250 gal. of 15 per cent hydrochloric acid, using straddle packers. This method proved to be troublesome. Communication behind the casing was established because of the relative proximity of perforated intervals. Cutting down the number of perforations to a minimum prior to the selective treatment and reperforating the entire zone following this selective treatment helped to improve completions. This technique was costly and time consuming, without giving satisfactory results. After a few days of fair initial production, the wells declined rapidly. No attempt was made at this time to produce from the crinoidal and cherty zone in this type of completion. Attempts to rework some of these wells in the crinoidal failed due to failure of the cement between the crinoidal and oolitic sections.

Method 2 was then adopted in an attempt to improve Virden and Scallion completions. After drilling out cement, an over-all nonselective acid treatment was performed, using approximately 500 gal. of 15 per cent hydrochloric acid. Initially the open hole was washed with the acid, and after the acid wash some of the acid was squeezed into the pay zone. This completion method resulted in a more satisfactory production-decline curve.

This type of completion was used during late 1954 and early 1955 in dual completions in the oolitic and crinoidal sections.

In treating both the oolitic and crinoidal, the cement in the shoe joint is drilled out to a point 7 ft. below the top of the crinoidal. The top 5 ft. of the crinoidal are perforated with 4 jets per foot and 8 bullets per foot. After the sand-oil treatment, which is the same as in Daly, the total oil used is recovered and the zone evaluated. The rest of the cement in the shoe joint is then drilled out by cable tools and the hole cleaned to bottom. The oolitic section is then washed with 12 bbl. of 15 per cent acid and approximately 50 per cent of the acid is squeezed into the pay zone. The zone is separately evaluated with a production packer set below the perforated interval in the crinoidal.

In completion Method 3, the two different treatments were performed with the help of an open-hole straddle packer. Acidizing was done first and sand-oil treatment afterwards. The use of the open-hole straddle packer is satisfactory for the sand-oil treatment, but it does not work too satisfactorily for the acid treatment. The acid communicates around the packer, preventing effective treatment. For this reason, completion Method 2 was preferred to Method 3.

About the time completion Method 2 was improving production in Virden-Roselea and North Virden fields, the cherty zone developed as a sizable and important reservoir.

Completion Method 2 was used to complete wells in the cherty zone by simply extending the open hole into it, and treating the oolitic and cherty zone with one acid job.

This procedure of casing through the crinoidal and leaving the oolitic and cherty zone open was perfected and adopted as a standard completion practice in this area. The problem of eliminating communication between the open hole and the perforated-crinoidal interval was solved by using rotating scratchers, Cementrol shoes, water ahead of cement to clean out filter cake, and by perforating only the top 5 ft. of the crinoidal.

A large number of wells were drilled during the last half of 1955 using the above procedure in North Virden field. Nearly all of these wells are producing their daily allowables from the cherty zones, which indicates up to 70 ft. of pay.

However, in the southern part of North Virden field quite a few wells were recompleted in the crinoidal zone, after the oolites and cherty zone (cherty zone is poorly developed in the southern part of North Virden field) did not make their allowables. All these reworks have been very successful and all of the wells have been capable of producing their allowables since workover.

Cased through completions . . . The fact that no communication has been experienced between the crinoidal and the oolites during above workovers, and previous crinoidal-oolite completions, brought back the idea to case the entire pay section through, to have better control for future reworks.

It was felt that the presence of filter cake is the main source of trouble for a cement job, preventing good adhesion between cement and the face of the well bore. The following cementing procedure was developed to assure maximum efficiency of cementing for cased holes:

1. Rotary scratches are used.

2. A calcium chloride wash (20 bbl.) followed by 10-30 bbl. of water precedes neat cement. The calcium chloride floculates the filter cake, and the water carries it away.

3. Rapid cement displacement with rig pump (cement displacement was formally done by cement truck).

A number of wells have been completed using the above procedure. Selective treatments were performed with perforated intervals only 9 ft. apart, without any indication of communication.

Production decline curves . . . Scallion 2-11 and Virden 13-24 show the effect of open hole vs. cased-hole oolitic completions (see Fig. 6).

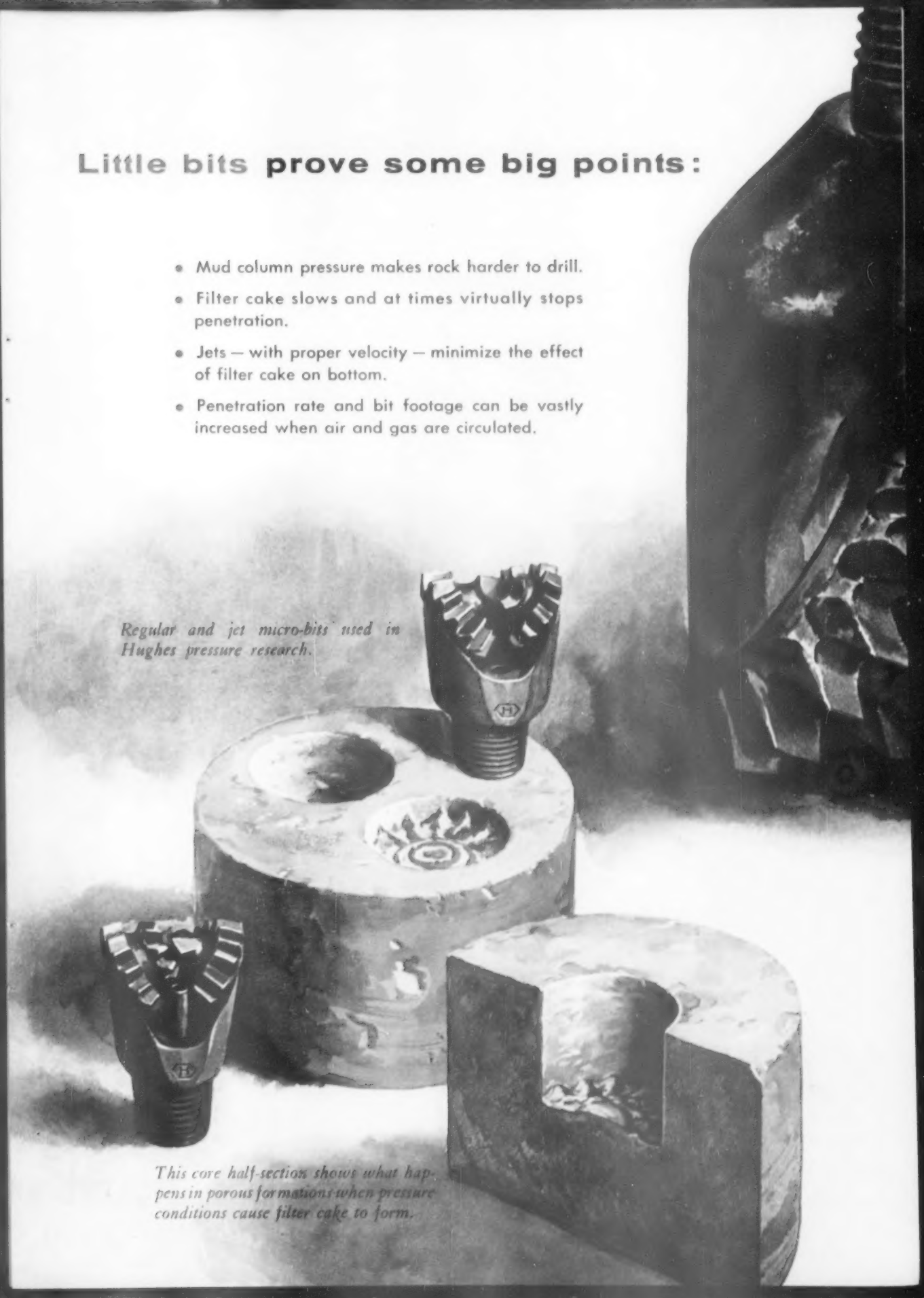
Virden 12-25, 4-25, completed in two zones, i.e., crinoidal and oolites, and cherty zone and oolites, respectively, show considerable improvement in their performance in comparison to wells completed in the oolites only (see Fig. 7).

Acknowledgments

The writer thanks California Standard Co. and Standard Oil Co. of California, for permission to publish this article. Appreciation is also expressed personnel of California Standard Co. who aided in preparation of the article.

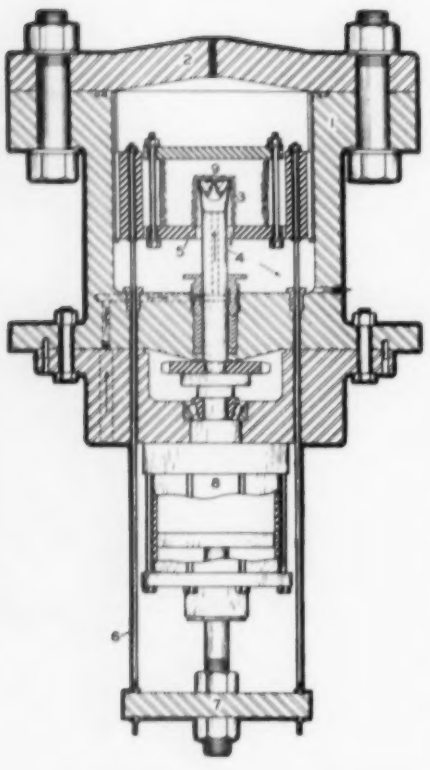
Little bits **prove some big points:**

- Mud column pressure makes rock harder to drill.
- Filter cake slows and at times virtually stops penetration.
- Jets — with proper velocity — minimize the effect of filter cake on bottom.
- Penetration rate and bit footage can be vastly increased when air and gas are circulated.

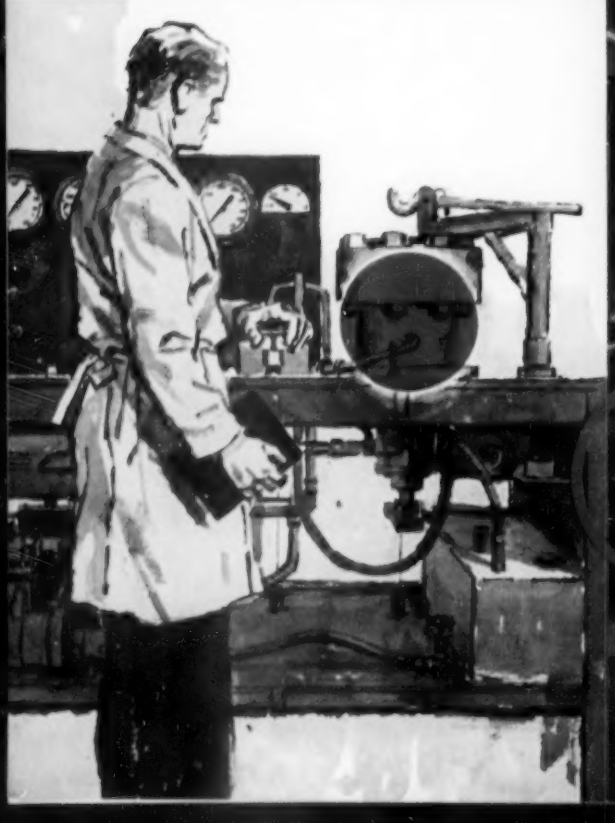


Regular and jet micro-bits used in Hughes pressure research.

This core half-section shows what happens in porous formations when pressure conditions cause filter cake to form.



Cross-section of micro-bit pressure chamber and, below, special drilling rig developed by Hughes engineers for pressure research.



Hughes research shows effect of mud column pressure on drillability of rock formations

We have long been curious to know *why* penetration rates decline as wells go deeper, and *why* some soft formations become difficult to drill.

In the search for these elusive *"whys"*, Hughes engineers designed and built a micro-bit drilling rig capable of developing pressures from zero to over 10,000 psi. In hundreds of laboratory drilling tests — many correlated with wells drilled in the field — we established that in most formations *drillability decreases as mud column pressure increases.*

We also found that when filter cake forms in soft, porous formations, jets having sufficiently high velocity can substantially accelerate the rate of penetration.

These important facts have helped to better define penetration problems and point the way to future gains. Further increases in penetration rates — vastly improved in recent years — is the continuing aim of HUGHES research, now in its 46th year.

HUGHES TOOL COMPANY

HOUSTON, TEXAS

DRILLING AT AN ELEVATION OF 8,149 FT. above sea level, Phillips-Husky et al 3-A, on top of Plateau Mountain, is the highest drilling operation ever carried on in Canada. (Photos courtesy Husky Oil & Refining Ltd.) Fig. 1.

"Big gas in small packages" shows . . .

Savanna Creek May Rival Pincher Creek

CANADA—Where Oil Is King

by Joseph S. Irwin

ONE year ago, natural gas in large quantity was discovered on the Savanna Creek anticline, 60 miles southwest of Calgary, Alta., in the Rocky Mountain region of western Canada. This unusual strike created active interest in many generally disregarded areas of western Alberta and Montana and eastern British Columbia*

It may be of interest to recount, briefly, accomplishments at Savanna Creek during the past year. Naturally, exploratory progress has been slow, due to the long vigorous winter in the mountains, and the substantial depth of the objectives (7,000-12,500 ft.). But results have been encouraging. A second large gas well indicated by drill-stem tests has been drilled, but has not been production-tested nor fully completed. A third well is now under way, and a fourth soon will start.

Major field in store . . . A gas/water interface, 1,220 ft. structurally lower than the highest correlative porosity found, has been established; and some basis for estimate of possible area and gas content of the structure has been provided. The incomplete information now available suggests the probable existence of more than one trillion cubic feet of disposable fuel gas at depths between 7,200 and 8,300 ft. in the third occurrence of the Rundle or Madison (Mississippian) limestone, twice repeated by major overthrusts.

With such major possibilities, continuation of the costly Savanna Creek exploration appears to be warranted. This is being done. A third well, No. 3A, is drilling on top of Plateau Mountain near the crest of the surface expression of the structure at an elevation of 8,149 ft. This is by far the highest drilling operation in Canada, and is 1,800 ft. higher than the earlier wells located in a transverse canyon.

No. 3A is designed to go to 12,500 ft., if necessary, at an estimated cost of $850,000, in search of the Devonian strata which may yield either oil or gas. The presently productive Rundle limestone (Mississippian) yields dry gas with a potentially valuable sulfur content.

Exploration and development of the Savanna Creek structure is being done by Phillips Petroleum Co., Husky Oil & Refining, Ltd., Northern Natural Gas Producing Co., Canadian Anaconda Oils, Ltd., and Target Petroleums, Ltd. These companies control 78,000 acres of petroleum and natural-gas rights covering the surface expression of the structure, an anticline more than 15 miles long and 4 miles wide.

Geology

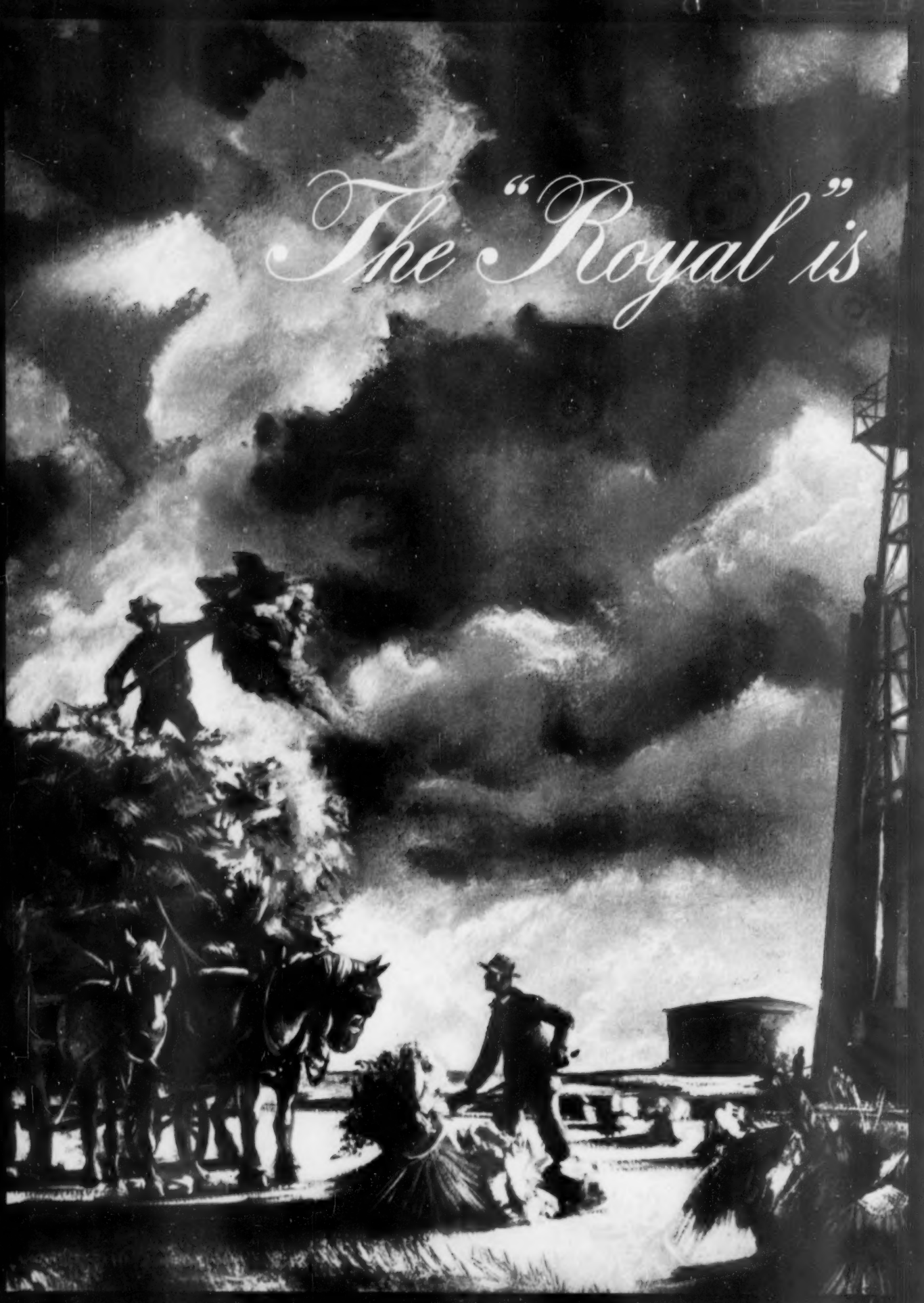
This possibly is the first exploration and development of a buried, folded fault plate. The surface structure is an overthrust (west to east) fault plate composed of Pennsylvanian and Mississippian strata some 1,600 ft. thick. These strata form a slightly domed anticlinal mountain, with steeply dipping east and west flanks, the whole resembling a turtle back.

The existence of the underlying fault plate was not known until the first well drilled by Anglo Canadian Oil Co., Ltd., in 1939 (total depth 3,375 ft.) demonstrated its existence at 140 ft. The stratigraphic break was from the Rundle-Banff contact zone (Mississippian) to Wapiabi (Upper Cretaceous), above the Cardium sandstone.

Since this fault did not emerge in the lower terrain to the eastward and therefore was buried at lower elevation than that found in the well, an eastward dipping fault zone was indicated. Since this eastward dipping fault plane did not crop out west of the well, it was inferred that a low-angle westward-dipping fault plane and plate had been folded subsequent to the faulting.

The completely exposed mountain massif was therefore a visible measure

*The Oil and Gas Journal, June 6, 1955.


The "Royal" is

Canada's Oil Bank

The Royal Bank of Canada has been serving the financial needs of Canada's petroleum industry for 30 years.

A branch of the "Royal" opened in Alberta's Turner Valley field back in the 20's. The important Leduc discoveries occurred in 1947; The Royal Bank opened a branch there the same year. Devon and Redwater branches followed in 1949. The "Royal" was the first bank to open branches in the now famous Pembina area in 1954. Today over 290 of this bank's 790 Canadian branches are located throughout the oil and gas rich western provinces. A special Oil and Gas Department, manned by officers with a wealth of practical experience in the financial aspects of the oil and gas business, has its headquarters in Calgary.

The complete banking services of the "Royal" and the specialized knowledge of its Oil and Gas Department are available to you anytime.

We do not provide information on oil securities.

As a special service, The Royal Bank's Oil and Gas Department in Calgary issues regular bulletins covering statistics, regulations, tariffs, oil and gas financing and other timely information on Canada's ever-expanding oil and gas industry. These bulletins are up-to-date, authoritative, easy to read and free on request. Just use the coupon below. No obligation, of course.

THE ROYAL BANK OF CANADA

Head Office: Montreal

Canada's Largest Bank

Assets exceed 3¼ billion dollars

The Royal Bank of Canada
Oil & Gas Department
108 Eighth Ave.
Calgary, Alberta

Gentlemen:
Please send me a list of current bulletins. I am particularly interested in:

_____

Name _____

City _____

State _____

DRILLING CONTRACTORS CAMP constructed by Loffland Brothers Drilling Co. of Canada sits atop Plateau Mountain at an elevation of 8,134 ft. Fig. 2.

CANADA—Where Oil Is King

of the folding which occurred subsequent to, or possibly in part concurrently with the devolpment of the latest (shallowest) overthrust.

A second fault plate, 5,100 ft. thick, composed of Cretaceous, Jurassic, and a portion of the uppermost Mississippian strata was then found. The 800 to 900 ft. of Rundle (Mississippian) involved in this second plate was an upper, generally unproductive portion of the Rundle, and it yielded only a small amount of gas (½ M.M.c.f. on drillstem test). It may be more productive farther west, where more section may be involved in the fault plate.

At 5,235 ft. in I Phillips-Husky, et al., a second major fault occurred, whereby the upper Rundle mentioned in the preceding paragraph was thrust over Kootenay (Jurassic). Below this overthrust, in normal sequence, the remainder of the Jurassic strata and a full section of Rundle limestone were penetrated; the Rundle portion was from 6,400-8,062 ft.

Gas in very large quantity occurred in porous zones with aggregate thickness of 350 ft. (by MicroLog). It may actually be substantially thicker. It was found at 7,208-8,155 ft. This productive interval is thought to include the main productive zone of the Turner Valley oil and gas field. Further drilling was in Banff (Mississippian), presumably near the Mississippian-Devonian contact at 9,040 ft., total depth.

Drilling future wells will show whether the Devonian will be entered in normal sequence below the Banff (Mississippian). In either case potentially productive objectives are offered.

Savanna Creek gas is relatively dry, but has a 13 to 14 per cent hydrogen sulfide content. Elemental sulfur content of the gas is therefore approximately 4½ tons per M.M.c.f. Withdrawals of 50 to 100 M.M.c.f. of gas per day, would thus result in the availability of 225-450 tons of sulfur per day when the gas is processed.

Reservoir pressure is approximately 2,800 lb. per sq. in.

Total hydrocarbon content is 84 to 85 per cent. Gross B.t.u. 950 per cubic foot.

Significance

Although the gas supplies for the great pipelines now building will come from many scattered sources, it is well known that big gas in small packages, i.e.—gas reservoirs of great thickness under high pressure, with relatively small area, make the largest, most dependable, and most profitable contribution to the projects.

Present information, although admittedly incomplete, seems to warrant the expectation that Savanna Creek may well be as important as Pincher Creek (2 trillion cubic feet disposable), Turner Valley (1.7 trillion cubic feet estimated original, depleted to 0.17 trillion disposable, June 30 1955), and Jumping Pound (0.776 trillion cubic feet, depleted to 0.55 trillion disposable, June 30 1955).

It may be comforting to the city of Calgary to note that should need arise, Savanna Creek could be connected to the Turner Valley-Calgary pipeline system, or to the Bow Island-Calgary system by a line 45 miles long. The Okotoks gas field and other indicated gas occurrences nearer to Calgary make this need seem to be somewhat other than soon.

THE AUTHOR

Joseph S. Irwin is a consulting geologist of Calgary, Alta. He is a graduate of the University of Missouri School of Mines. After his graduation, he served as an instructor at the university for 2 years, and later at Lehigh University. He was a geologist for Carter Oil Co. until 1917, and soldiered with the 89th Division of the U. S. Army in World War I. After his release from the service, Irwin joined the Producers and Refiners Corp. in Denver. He moved to Alberta in 1929, and has been a consultant there since 1932.

CORES of Rundle - Mississippian limestone over a 770-ft. interval between 7,710 and 8,480 ft. were taken from Savanna Creek's second completed gas well, the 2-A.

MANNESMANN TUBE COMPANY, LTD.

Sault Ste Marie, Ontario
Telephone: Algoma 3-2355
Cable Address: MANNESTUBE

AN OPEN LETTER TO THE PUBLIC:

SOON, OUR NEW AUTOMATIC SEAMLESS STEEL PIPE MILL, NOW NEARING COMPLETION AT SAULT STE. MARIE, ONTARIO, WILL BE IN PRODUCTION. DESIGNED PRIMARILY TO SERVE THE OIL INDUSTRY, ITS MAIN PRODUCTS WILL BE SEAMLESS OIL-WELL CASING AND LINE PIPE.

THE NEW MILL UTILIZES THE MOST MODERN EQUIPMENT AND TECHNIQUES, AND INCORPORATES SEVERAL NEW FEATURES NOT FOUND IN ANY EXISTING PIPE MILLS. THE MOST ADVANCED QUALITY-CONTROL METHODS, INCLUDING THE NEWEST INSPECTION AND TESTING DEVICES, HAVE BEEN INSTALLED.

INITIAL CAPACITY WILL BE 225,000 TONS PER ANNUM IN SIZES FROM 4½" O.D. THROUGH 10¾" O.D., TO API SPECIFICATIONS 5A, 5L, AND 5LX.

IT GIVES US REAL PLEASURE TO INFORM OUR FRIENDS IN THE OIL INDUSTRY THAT MANNESMANN TUBULAR PRODUCTS, LONG KNOWN TO THEM FOR UTMOST QUALITY AND DEPENDABILITY, WILL BE AVAILABLE SOON, "MADE IN CANADA".

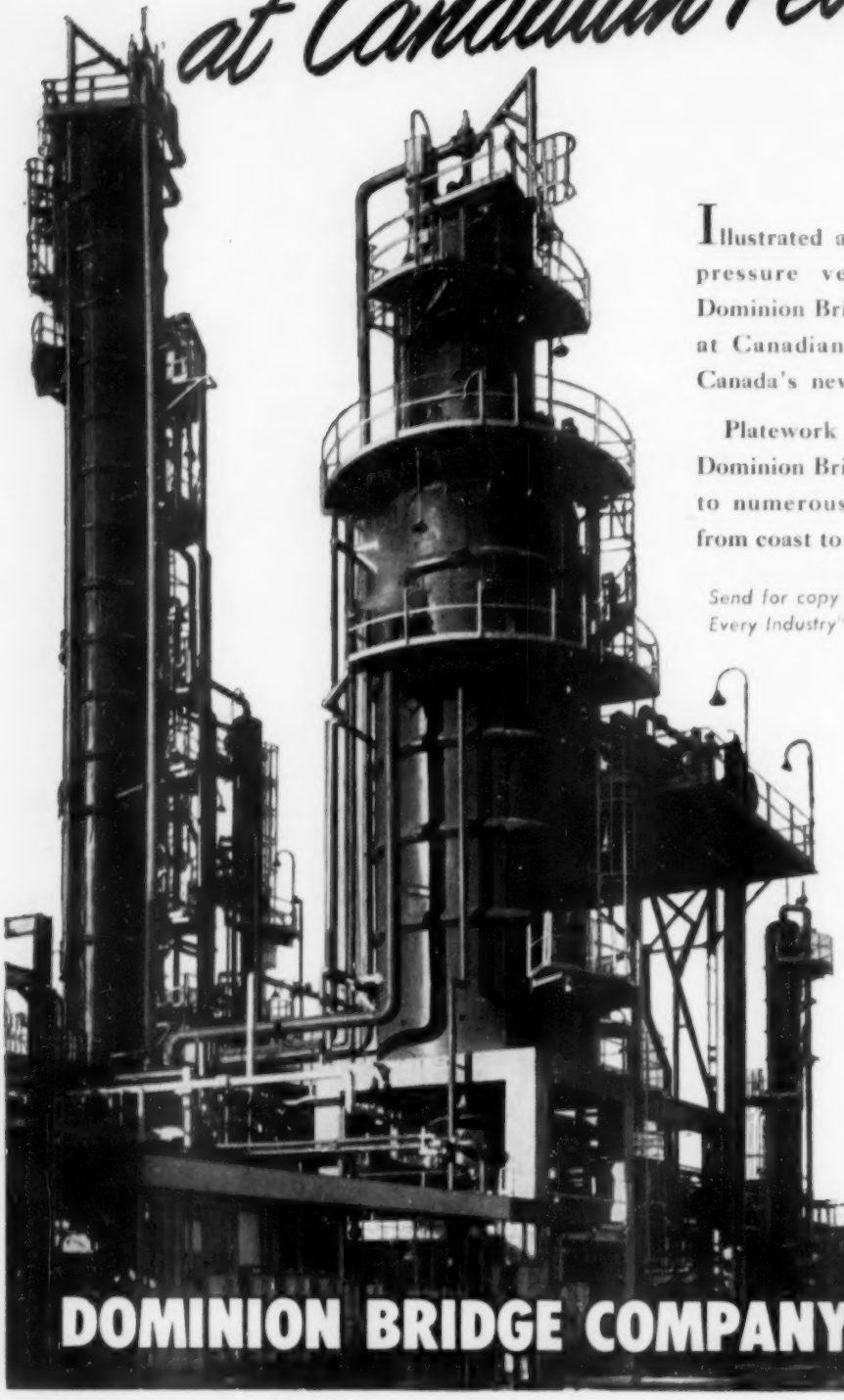
OUR SALES STAFF IS MAKING EFFORTS TO CONTACT ALL PIPE USERS; BUT WE SHOULD ALSO BE GRATEFUL FOR YOUR INQUIRIES WHICH MAY BE ADDRESSED TO OUR PRINCIPAL SALES OFFICE IN SAULT STE. MARIE, ONTARIO.

ESTABLISHMENT OF THIS NEW MILL REFLECTS OUR FIRM CONFIDENCE IN THE FUTURE OF THE OIL INDUSTRY, AND OUR EARNEST DESIRE TO RENDER THE FINEST SERVICE. WE SHOULD BE HAPPY TO ASSIST YOU WITH YOUR 1957 PIPE REQUIREMENTS; AND IF THERE IS ANY WAY IN WHICH WE CAN BE OF ADDITIONAL SERVICE, THE MEMBERS OF OUR ORGANIZATION, AND I, PERSONALLY, WILL WELCOME YOUR SUGGESTIONS.

SINCERELY YOURS,

GERHARD WAGNER, PRESIDENT

DOMINION BRIDGE
at Canadian Petrofina



Illustrated are two of many large pressure vessels fabricated by Dominion Bridge and now in service at Canadian Petrofina Limited—Canada's newest refinery.

Platework and structural steel by Dominion Bridge have been supplied to numerous Canadian refineries from coast to coast.

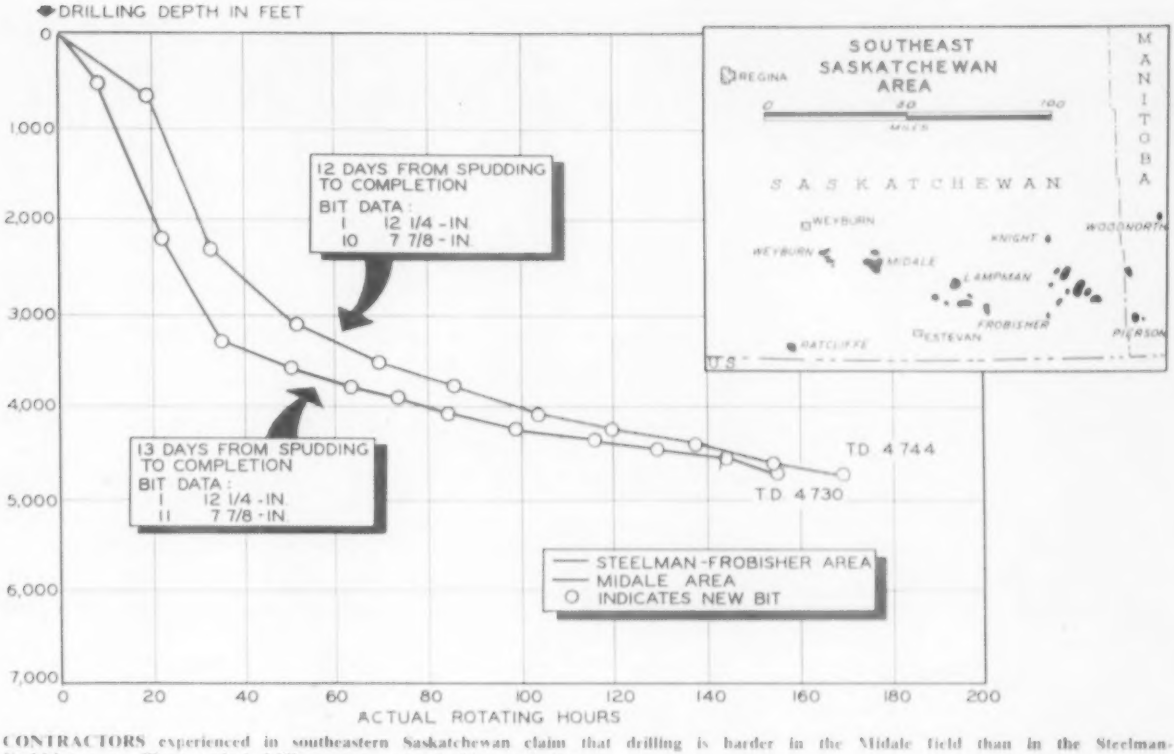
Send for copy of booklet "Platework for Every Industry" Publication No. PNN-100

DIVISIONS
- PLATEWORK
- STRUCTURAL
- MECHANICAL
- BOILER
- WAREHOUSE

Plants at:
MONTREAL
OTTAWA
TORONTO
WINNIPEG
CALGARY
VANCOUVER

Associate Company Plants at:
AMHERST
QUEBEC
SAULT STE. MARIE
EDMONTON

DOMINION BRIDGE COMPANY LIMITED



CONTRACTORS experienced in southeastern Saskatchewan claim that drilling is harder in the Midale field than in the Steelman-Frobisher area. These typical drilling curves support this conclusion.

Drilling Surges in Southeastern Saskatchewan

by Norman S. Morrisey
Drilling-Development Editor

SOUTHEASTERN Saskatchewan is becoming the mecca for Canadian drilling contractors. Production is from the Mississippian limestone section and shallow drilling depths range from 3,550 ft. at Nottingham to 4,700 ft. at Steelman.

Most of the current activity is centered in Midale or Steelman-Frobisher fields. Contractors are using rigs in the 5,000-6,000-ft. class and many of the rigs are trailer-mounted. Contracts for field wells are on footage basis and average between $3.75 and $4.25 per ft.

Road conditions in Southeast Saskatchewan are usually fair since the soil is rather sandy.

Freezing weather . . . Severe winters are the rule and a normal winter will see much snow and high winds that cause large snow drifts. Boilers and other winterizing equipment are an absolute necessity, according to contractors experienced in the area. Blizzard conditions are frequent in the winter. Then the cost of operating rigs is excessive due to the cost of keeping roads open and communication expense. A blizzard can delay a move for several days.

Contractors can move in, drill a 4,700-ft. well, and move out in as little as 12-14 days. The operator usually completes the well with a service rig—releasing the rotary when the oil string is run.

Mud program . . . In the Midale area, operators are using a native mud to the top of the Amaranth at about 4,100-ft. drilling depth. A gypsum-starch mud is then used to total depth. The usual procedure is to add salt to the gypsum-based mud just above the Charles porosity to adjust the mud resistivity.

DRILLING REPORT

Southeast Saskatchewan

Pay zone	Mississippian
Total depth (average) ft.	4,600-4,800

Normal Rig-Time Distribution

Days on footage rate	10-12
Days on day work rate (service rig)	2-4
Total days (spud to rig release)	12-15

Cost Data

	Average
Footage price, per ft.	$3.75-$4.25
Day work rate with drill pipe per hour	$34
Day work rate without drill pipe per hour	$30

Bit Data

Total number of bits	9-12
Feet per bit (average) ft.	475-575

Water supply: Ponds during summer; hauling during winter.

Nearest supply center: Estevan.

Terrain and roads: Terrain is flat, spotted with sloughs. Roads vary from poor to good. Sandy soil usually dries quickly after a rain.

Typical Casing Program

Surface: 8⅝-in. or 10¾-in. at 400-600 ft.

Oil string: 4½, 5½, or 7-in. set on top of or through the pay zone.

Typical Mud Summary

Material—	Amt. lb.
Bentonite	2,000
Salt	2,000
Sapp	300
Plaster of paris	2,000
Mylogel	3,000
Preservative	400

Geological Data

Typical well, Midale area

Formation tops—	Depth (ft.)
Viking	2,900
Dakota	3,150
Swift	3,550
Piper lime	3,950
Amaranth	4,200
Charles	4,500

CANADA—Where Oil Is King

Mississippian oil potential established . . . so

Southern Saskatchewan Makes Big Plans

by P. F. Brennan and R. R. Graves

CANADA—Where Oil Is King

THE area considered in this article is in the northern portion of the Williston basin, which is structurally centered in the northwestern part of North Dakota. The northern limits of the Williston basin proper have been the subject of some dissension. However, it seems clear that the Mississippian rocks presently represented in the subsurface of southern Saskatchewan belong to the basin, and it is in this light that they are to be considered here.

The formations comprising the Mississippian system dip at varying rates to the southeast, south and southwest into the basin, and in Saskatchewan they reach a maximum thickness of about 1,600 ft. between the second and third meridians along the International Boundary. From this basinal thick area, the Mississippian strata taper to the north, east and west. This results from a combination of the regressive nature of Mississippian sedimentation and the progressive truncation and bevelling of Mississippian beds during the protracted period of erosion following the withdrawal of the Paleozoic seas.

The northeastern flank of the basin is the better defined and it is here, where the Mississippian strata attain their greatest structural gradient, that the bulk of the Mississippian oil discoveries in Saskatchewan have been made. These oil occurrences would seem to be directly related to this structural gradient. The western edge of the Saskatchewan portion of the Williston basin is less well defined, and tends to merge gradually into the sedimentary area of the Alberta plains to the west.

Regional Geology

The close of Paleozoic time in the Williston basin saw considerable uplift and erosion of the rocks deposited. This resulted in the formation of a regional erosional surface, which truncated Mississippian and older Paleozoic strata in directions outward from the basinal area. Now this regional unconformity dips southeast, south and southwest, following closely the present-day structural configuration of the basin, but at a lesser rate of dip than the underlying Mississippian and older Paleozoic formations.

As a result of this, the progressively truncated Mississippian and older formations subcrop on this Paleozoic erosional surface, in a series of arcs trending northwestward and westward through southwestern Manitoba and southern Saskatchewan. This progressive truncation proceeds northeast and north to the area of exposure of basement rocks in the Canadian shield in northern and northeastern Saskatchewan. The entire bevelled surface is progressively overlapped to the north and northeast by Jurassic and Cretaceous sediments.

The location map (Fig. 1) shows the oil fields presently producing in the area of southern Saskatchewan. The contours are drawn on the Paleozoic erosional surface and show the southeast, southwest, and south dip of this surface into the present structural basin.

Stratigraphy

Mississippian rocks in southern Saskatchewan can be divided into four formations. These are, in ascending order, the Bakken, the Lodgepole, the Mission Canyon, and the Charles.

Bakken . . . The Bakken basal unit of the Saskatchewan Mississippian, is a dominantly clastic formation correlative with the Exshaw of Alberta. It varies in thickness from the edge to a maximum of 115 ft. and comprises an upper and a lower shale member and a medial member composed of dolomitic siltstone. This latter unit is emerging as an oil reservoir in the Roncott area of the south-central part of the province, and is a producing horizon in the extreme western part where it is locally named the Coleville sand.

Lodgepole . . . The remaining three Mississippian formations, Lodgepole, Mission Canyon, and Charles, are dominantly carbonate in composition, and together comprise the Madison group. The Lodgepole, lowest of the group, is also the thickest, with a maximum development in excess of 600 ft. Basinward, the Lodgepole lithology is predominantly dark gray, dense, argillaceous limestone, while the updip or marginal deposits are typified by cherty crinoidal limestones with occasional occurrences of algal or oolitic limestones.

The Lodgepole formation is nowhere productive in Saskatchewan yet, but is a relatively prolific producer of high-gravity oil in the adjoining province of Manitoba to the east.

Mission Canyon . . . The Mission Canyon formation attains a maximum thickness of 500 ft. in its best area of development and is dominantly composed of buff, tan, and brown fossiliferous, granular limestone. Crinoidal, oolitic and algal limestones are commonly developed in this formation, and cyclic sequences involving rhythmic deposition of dense lithographic, bioclastic, fragmental, and oolitic limestones, and silts, can be discerned.

Sands are locally developed in this formation, in the southeast corner of the province. In the producing area, the Mission Canyon has been subdivided into five lithologic units designated MC-1 to MC-5, in ascending order. This formation has emerged as the most important and promising Mississippian producing horizon in the area, and active exploration for Mission Canyon oil is continually resulting in new discoveries.

Charles . . . The Charles formation,

THE AUTHORS

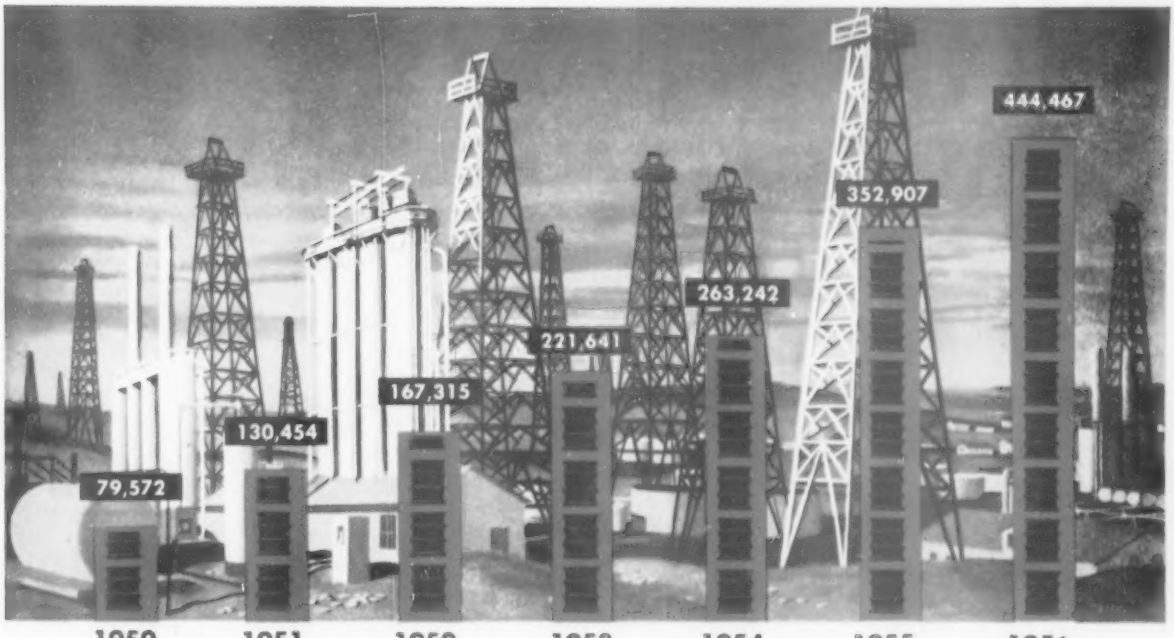
P. F. BRENNAN

R. R. GRAVES

P. F. Brennan, district geologist for Mobil Oil of Canada, Ltd., eastern Saskatchewan district, based at Regina. He is a graduate in geology from University of Durham, England. After spending some years in the Middle Eastern oil area, he came to Canada in 1952 and joined the Socony-Vacuum Exploration Co., at Calgary, Alta.

R. R. Graves joined Socony Vacuum Exploration Co. (now Mobil Oil of Canada, Ltd.) in 1953. Since then he has been stationed in Mobil Oil's Regina district office. Graves is a graduate of University of Alberta and has a bachelor of science degree in geology.

This article published by permission of Mobil Oil of Canada, Ltd.



(Approximate production figures in barrels per day)

Canadian Oil Barrels Ahead!

Canada's 1955 oil production was up a remarkable 34% over 1954, and for the first month of 1956 production was running 26% over the average figure for 1955. A big oil find has recently been reported north of the famous Peace River district and it has precipitated the "biggest oil rush" in the history of Northern Alberta.

If you're interested in preliminary planning information and services or oil financing, call in Canada's First Bank—the Bank of Montreal. The B of M has aided many U. S. firms in the set-up and operation of their Canadian oil enterprises. With 240 branches in Canada's oil-rich western provinces, Bank of Montreal is on-the-scene whenever and wherever you need assistance.

Ask the B of M about...

Canadian Company Formation
Exploration Regulations
Reservations of Oil and Gas Rights
Lease Terms and Royalties
Taxation and Exchange
Financing

CONTACT J. Austin Richards, Special Representative, Bank of Montreal, Calgary Main Office, 140 Eighth Avenue West, Calgary, Alberta, Canada. (Telephone 2-8333) or address to nearest U. S. office or Head Office, Montreal.

NO STOCK RECOMMENDATIONS
While the Bank is prepared to provide all available information on the oil industry, it does not *make recommendations regarding the purchase of individual oil stocks.*

"MY BANK" TO 2 MILLION CANADIANS
B of M

BANK OF MONTREAL

Canada's First Bank Coast-to-Coast

In Canada since 1817 • In the U. S. since 1859

NEW YORK . . . 64 Wall Street • SAN FRANCISCO . . . 333 California Street
CHICAGO: Special Representative's Office, 141 West Jackson Blvd.

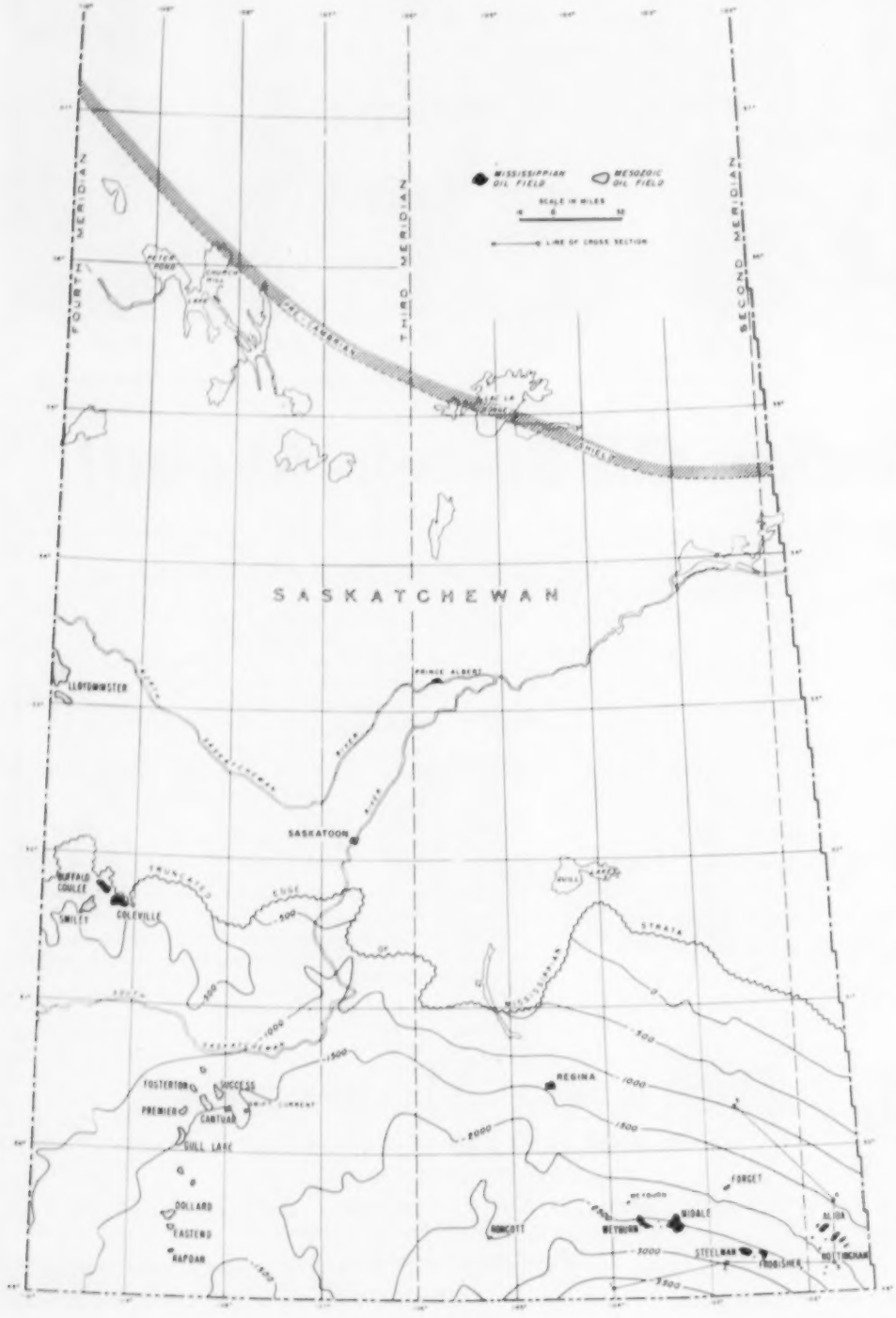
Head Office: Montreal

675 BRANCHES ACROSS CANADA • RESOURCES—$2,700,000,000

uppermost unit of the Saskatchewan Mississippian, is more restricted in its present development than other Mississippian formations, and reaches a maximum thickness of some 400 ft. It consists of evaporites, dolomites, and red silty shales, and subordinate developments of limestone units such as the Charles A unit, Charles B unit, and Midale-pay zone. The Charles is an important producing horizon in the southeast corner of the province, and is the object of an aggressive exploration play.

As previously noted, the Mississippian formations in Saskatchewan are progressively truncated to the northeast and north by the Paleozoic erosional unconformity. Fig. 2 shows the truncation edges of these formations, and their close association with the producing Mississippian fields of the area. The truncation of the individual formations is further illustrated by the southwest-northeast cross-section in Fig. 3. For ease of reference, the Mississippian stratigraphy of the area is shown in conventional tabular form in Fig. 2.

Lateral-facies variations within the various Mississippian formations tend to complicate correlations on a regional scale, and some argument exists as to the precise position of the Charles-Mission Canyon contact in the southeastern part of the province. This is not considered important, however, in a general discussion of the producing fields of the area.

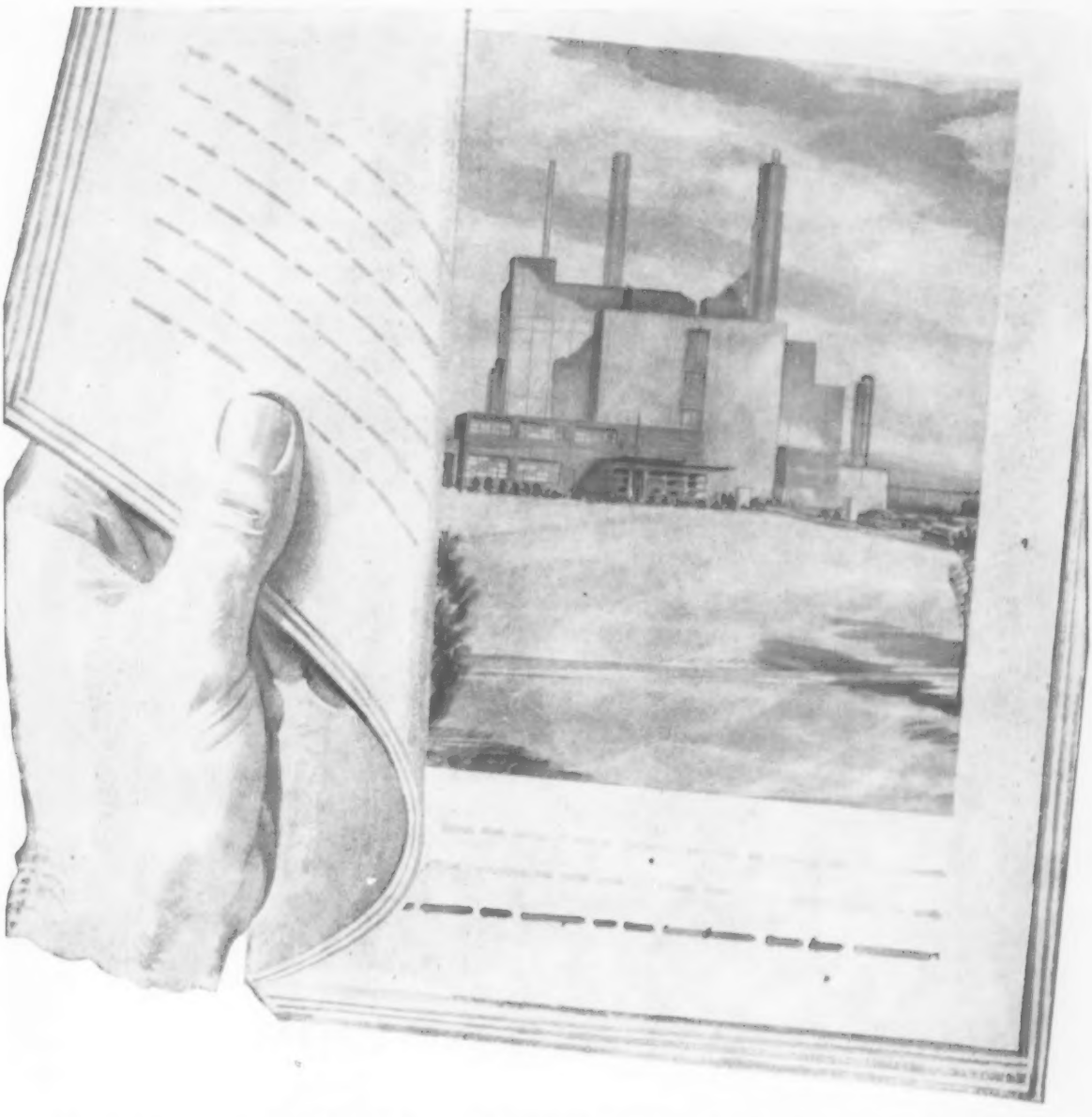


SOUTHERN Saskatchewan's oil fields lie in the northern lobe of the Williston basin. Contours here show the configuration of the Mississippian erosional surface. Fig. 1.

Mississippian Fields

Daily oil production in Saskatchewan during the early months of 1956 averaged 45,000 bbl. About one-third of this total was produced by oil fields located in rocks of Mississippian age. All Mississippian oil fields found to date in the province are considered as being stratigraphic in nature. In addition, with one major exception, all Mississippian fields so far discovered lie in the extreme southeastern corner of the province.

The exception is the Buffalo Coulee-Coleville area of western Saskatchewan, lying close to the Alberta border.



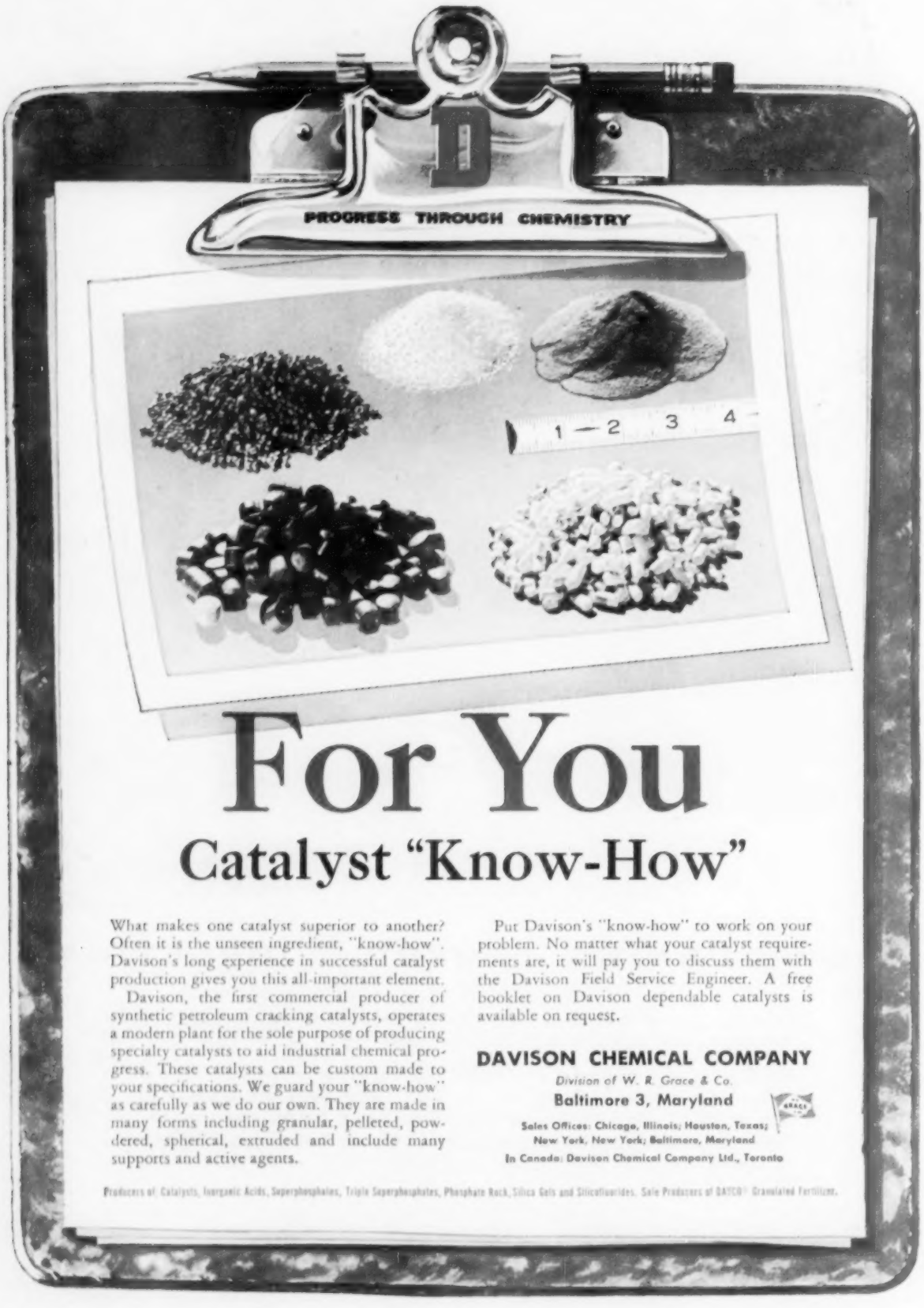
NOW TURNING TOWARD COMPLETION

Very soon, you can chalk up another "First" for expanding Canadian industry — the manufacture of "Ethyl" antiknock compounds.

Ethyl of Canada's new plant near Sarnia is approaching completion. When it swings into operation, delivery time on "Ethyl" fluid shipments to Canadian refiners will be materially shortened, permitting a more flexible operation. The Canadian oil industry will also be assured an adequate *domestic* supply of this important ingredient used in the economical production of today's high octane gasolines.

ETHYL CORPORATION OF CANADA LIMITED

76 St. Clair Ave. W., Toronto, Ontario, Canada



For You

Catalyst "Know-How"

What makes one catalyst superior to another? Often it is the unseen ingredient, "know-how". Davison's long experience in successful catalyst production gives you this all-important element.

Davison, the first commercial producer of synthetic petroleum cracking catalysts, operates a modern plant for the sole purpose of producing specialty catalysts to aid industrial chemical progress. These catalysts can be custom made to your specifications. We guard your "know-how" as carefully as we do our own. They are made in many forms including granular, pelleted, powdered, spherical, extruded and include many supports and active agents.

Put Davison's "know-how" to work on your problem. No matter what your catalyst requirements are, it will pay you to discuss them with the Davison Field Service Engineer. A free booklet on Davison dependable catalysts is available on request.

DAVISON CHEMICAL COMPANY

Division of W. R. Grace & Co.

Baltimore 3, Maryland

Sales Offices: Chicago, Illinois; Houston, Texas; New York, New York; Baltimore, Maryland

In Canada: Davison Chemical Company Ltd., Toronto

Producers of: Catalysts, Inorganic Acids, Superphosphates, Triple Superphosphates, Phosphate Rock, Silica Gels and Silicofluorides. Sole Producers of DAVCO® Granulated Fertilizers.

In this area 13° to 14° A.P.I. crude is produced from a basal Mississippian sand member, which is correlative with the medial silt member of the Bakken formation. The sand member is locally termed the Coleville sand, and a large number of wells have been successfully completed in this horizon.

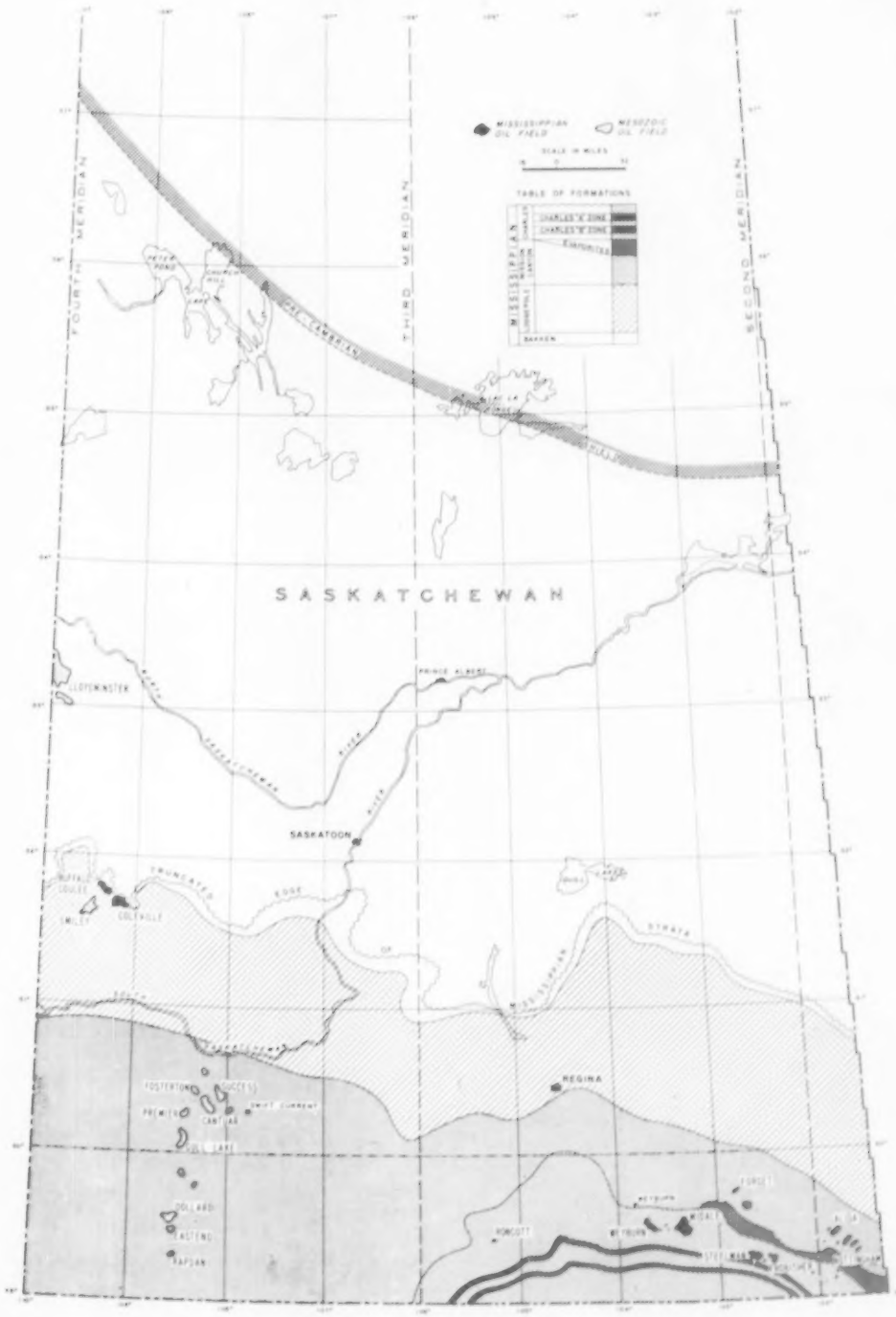
Fig. 1 clearly indicates that the Mississippian oil fields of southeastern Saskatchewan occur in two prominent and well-defined belts, both of which trend in a northwest-southeast direction, approximately paralleling each other and spaced a considerable distance apart. The first of these is the Weyburn-Midale-Frobisher trend and the second, the Forget-Alida-Ingoldsby trend.

The generalized paleogeologic map in Fig. 2 shows the first named belt to be intimately associated with the truncation edge of the Charles formation, and the second belt with the updip truncation edge of the MC-3 to MC-5 members of the Mission Canyon formation.

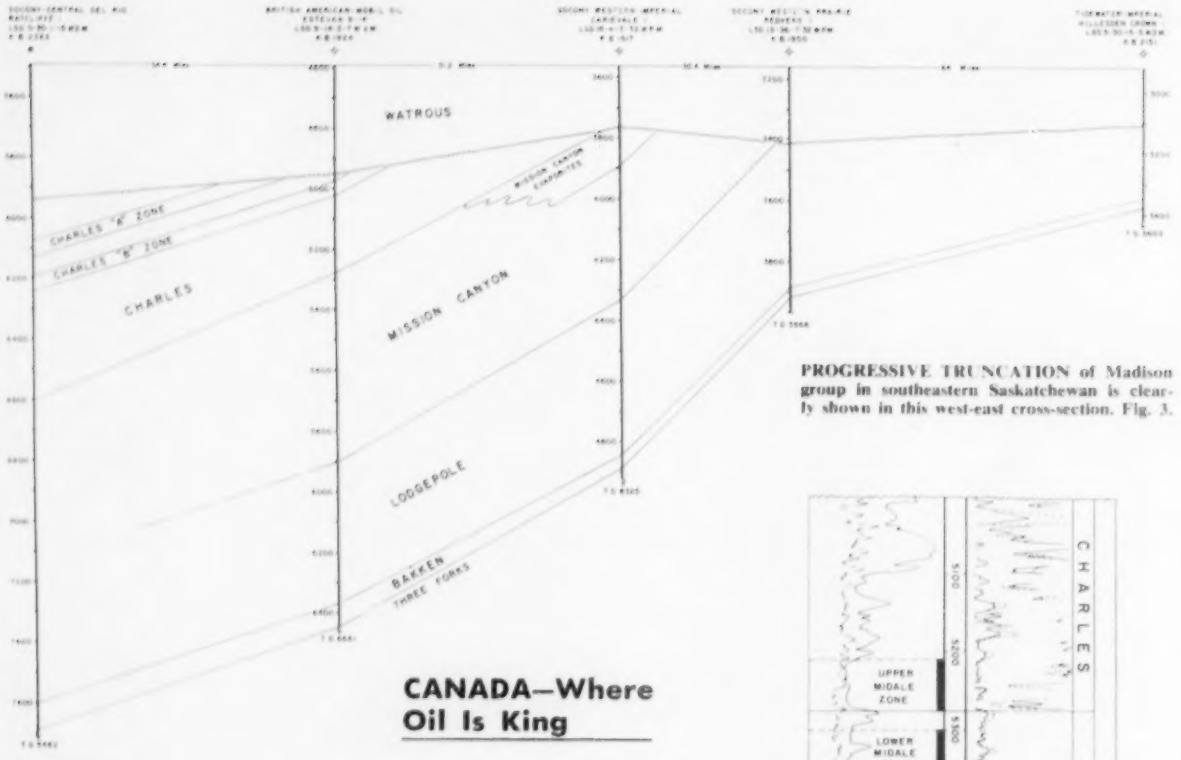
Weyburn-Midale-Frobisher trend . . . The fields in this trend produce from two pay zones, known as the upper and lower Midale pay zones, after Midale field, one of the more important fields of this belt. The upper Midale pay is the most important and prolific to date, and comprises a porous unit of buff to tan, granular, somewhat marly limestone, located near the base of the Charles formation, attaining a maximum thickness of 40 ft. in the area. The lower Midale pay zone, which is only partially explored and sporadically productive throughout the length of the oil-field belt, is located just below the top of the Mission Canyon formation as generally defined in the area.

The oil fields producing along the Weyburn - Midale-Frobisher trend are localized downdip from the subcrops of the upper and lower pay zones on the Paleozoic surface, with the lower and deeper pay being truncated slightly north and east of the upper. Considerable alteration of the porous zones occurs at the points of truncation.

This, together with the overlying impermeable Watrous shales, and local



PALEOGEOLOGIC map of the pre-Mesozoic Mississippian surface reveals alignment of southeastern Saskatchewan oil fields with truncation edges of the Charles and Mission Canyon formations. Fig. 2.



PROGRESSIVE TRUNCATION of Madison group in southeastern Saskatchewan is clearly shown in this west-east cross-section. Fig. 3.

CANADA—Where Oil Is King

development of primary anhydrite within the pay zones, effects an updip seal for the oil accumulations. Alteration and infill also greatly affect the development of porosity in the pay zones throughout the oil-field belt. Some slight indications of structural control are present in individual fields.

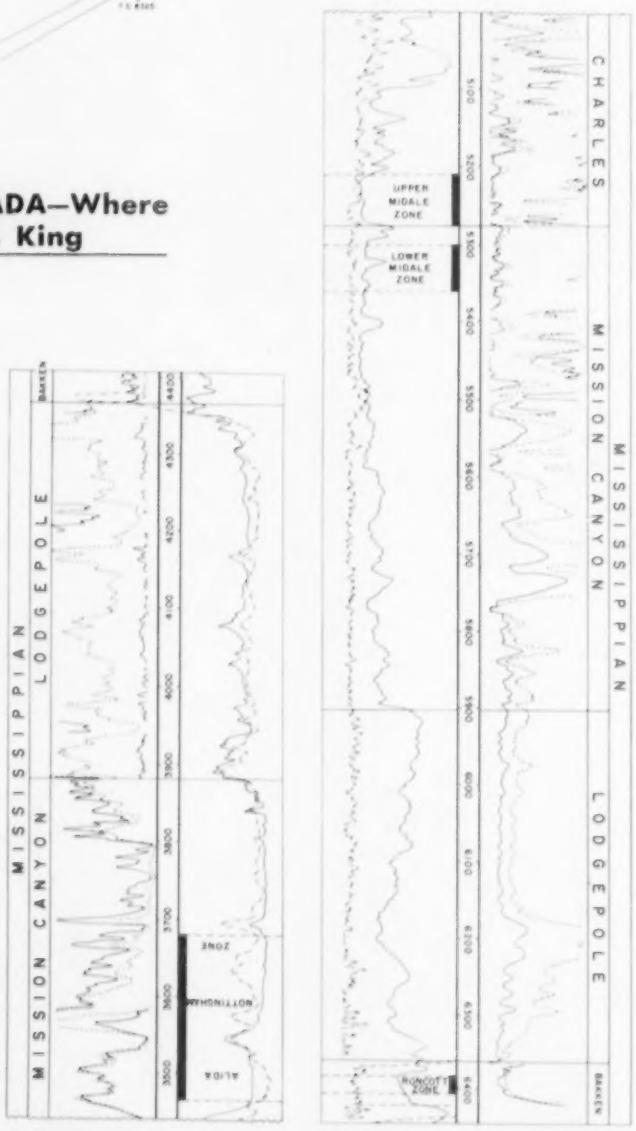
The oil fields along this trend are as yet incompletely defined. In most cases, the lateral limits of individual fields are not yet known, and there are indications that certain of the presently separate field areas will coalesce to form larger development areas as infill drilling proceeds. In some cases, also, the southwesterly downdip limits of the oil accumulations have not yet been established.

At present, the largest field in this belt is Midale. Here, production has been established in both the upper and lower pay zones. The field has some 100 wells capable of oil production, and is producing 28° A.P.I. crude at rates in excess of 3,200 bbl. per day.

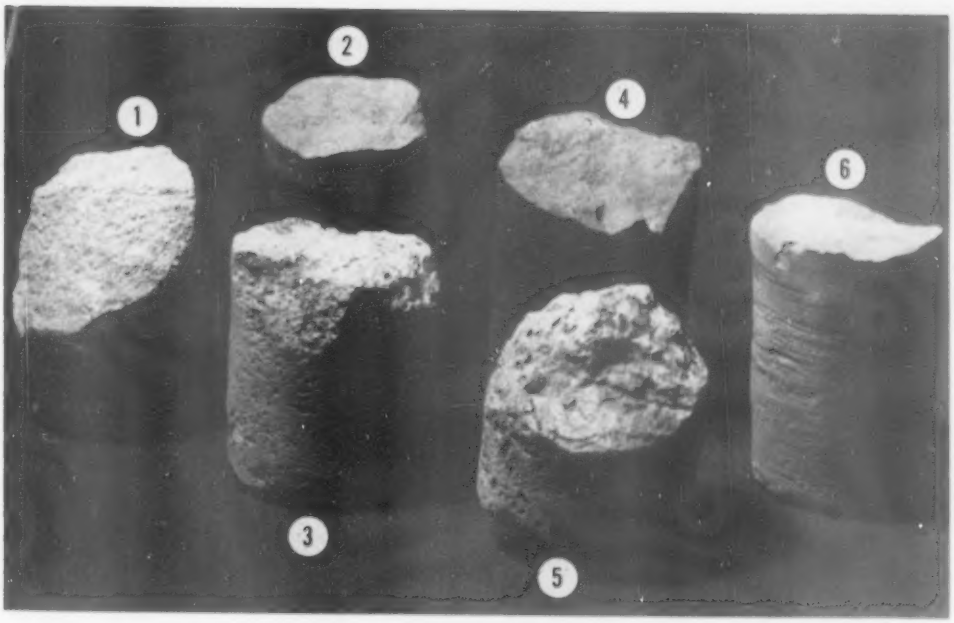
Steelman field is the second largest in this development area, and has 43 wells capable of production. It produces in excess of 1,500 bbl. of oil per day, ranging from 35° to 38° A.P.I. gravity.

Frobisher field, third largest of this trend, has some 27 wells which turn out about 1,000 bbl. per day of 38° A.P.I. crude.

Smaller fields along the same trend include Dillman with 7 wells and Lampman with 9.



TYPE LOGS of the two principal oil-field trends in southeastern Saskatchewan indicate stratigraphic position of the various pay horizons in the fields. Fig. 4.



CORE photograph of the five Mississippian reservoir rocks in southeastern Saskatchewan. (1) MC-1 fragmental limestone. (2) Midale pay zone granular limestone. (3) MC-3 algal limestone. (4) MC-3 granular limestone. (5) MC-5 vugular limestone. (6) Bakken medial siltstone. Fig. 5.

The most northwesterly of the fields, and as yet the most undefined, is Weyburn, which now contains 12 wells, producing about 400 bbl. per day of 33° oil from the upper Midale pay zone. Scattered stepouts to the east of Weyburn indicate a possible connection with the main Midale development area.

The average drilling depth to the upper pay along the Weyburn-Midale-Frobisher trend is 4,500 ft. and the wells are spaced on an 80-acre pattern. Logging devices favored in field development wells include the Microlaterolog in association with the conventional electrical log or the Laterolog. In addition, radioactivity logs are finding increasing use in the area.

Forget-Alida-Ingoldsby trend . . . The oil fields in the Forget-Alida-Ingoldsby Mission Canyon trend have several features that make them unique in the area. Forget field, which has only marginal production from the Mission Canyon MC-4 member, was the first field discovered on this trend. It was discovered in February 1953. Development and wildcat drilling since the Forget discovery has revealed that the productive features on this trend are ancestral topographic erosional ridges on the Paleozoic surface. Presumably they result from a drainage pattern developed on the Mission Canyon outcrop area.

Topographic falloff on the flanks of these ridges gives a semblance of anticlinal structure, but drilling to structural markers deep within the ridges has shown structure beneath them to be essentially regional. The oil accumulations are localized where these topographic ridges cross the subcrops of porous units of the Mission Canyon formation on the Paleozoic erosional surface.

The oil accumulations in these ridges are stratigraphically entrapped in porous reservoir beds of the MC-3, MC-4, and MC-5 members of the Mission Canyon formation. The cap rock for these topographic fields consists of both altered limestone at the eroded Mission Canyon surface and impermeable basal red shales of the unconformably overlying Jurassic-Watrous formation. The tight cap of altered limestone characteristically thickens off the flanks of the ridges. This causes a very sharp falloff of the main reservoir porosity off the flanks, accentuating the linear northeast-southwest trend of individual fields.

The MC-5 member is the producing horizon in the southwestern and downdip end of most of the larger fields of the area, but in each field this member is characteristically truncated across the ridge, with the oil column moving continuously across into the MC-3 member. The MC-5 is mainly composed of vuggy porous microcrystalline to pseudo-oolitic and pisolitic limestone, and has generally better reservoir characteristics than the MC-3 member, a finely crystalline to granular limestone with bioclastic and oolitic bands.

The intervening MC-4 member is quite thin, and in reality is a less porous basal unit of the MC-5. Although containing dense, argillaceous streaks, the MC-4 is generally considered to form part of the MC-3 and MC-5 continuous oil reservoir.

The larger fields in the area have a variable gas cap at the northeast,

CANADA—Where Oil Is King

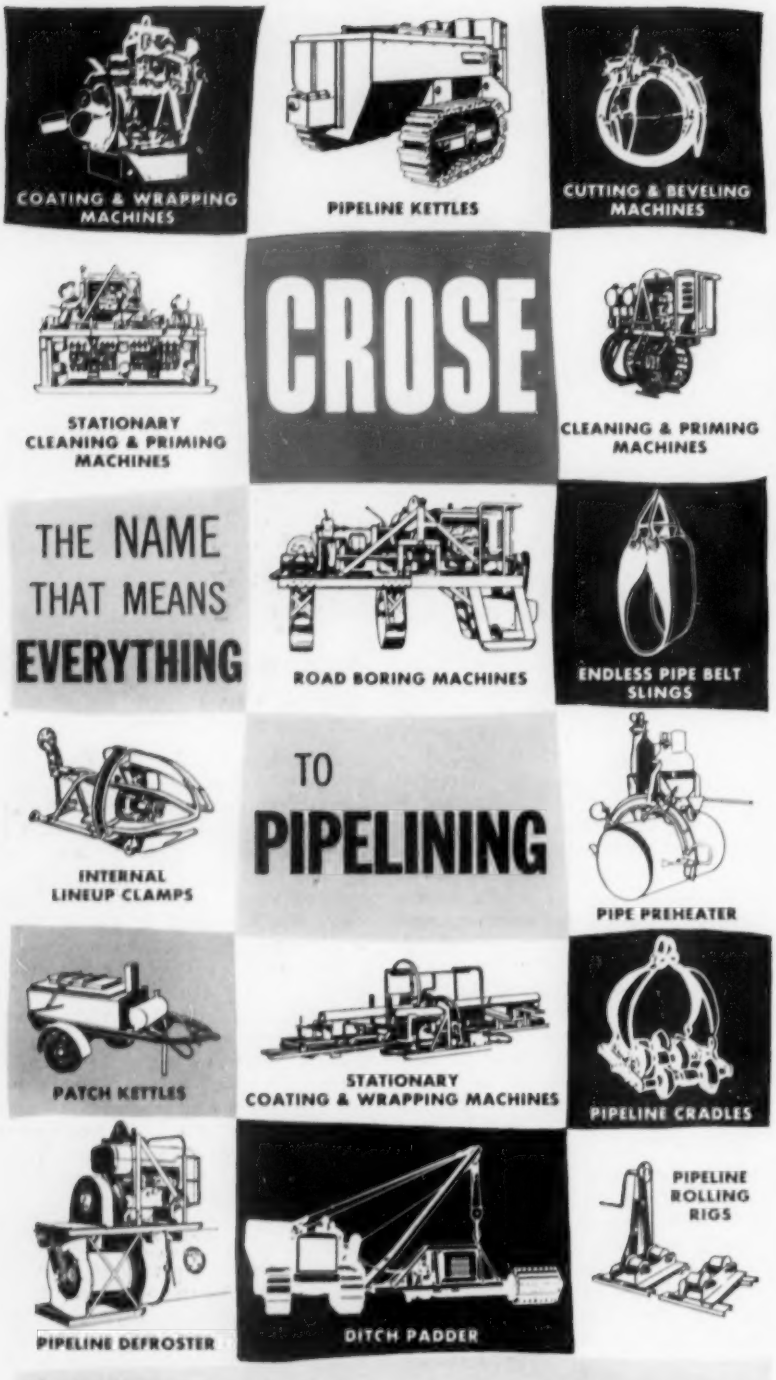
updip end, in MC-3 rocks. This is underlain by a clean oil zone which attains a maximum thickness of 86 ft. in Nottingham field. This clean oil zone is underlain by a "transition zone" of variable thickness with a gradually increasing water saturation in a downward direction, until at bottom there is a 100 per cent water section.

The upper part of this transition zone, or that part with less than a 50 per cent saturation of connate water, is considered as pay section, and will produce either clean oil or oil with varying water cuts on test. This "effective transition zone" contains important reserves in Alida and Nottingham fields, and forms the pay zone of flank wells which are structurally below the oil-transition contact.

The bottom water in these fields is highly saline, and the oil-water contact in each field slopes southwest with the regional dip. The bottom of the MC-3 to MC-5 aquifer is marked by the dense, impermeable MC-2 unit of the Mission Canyon, which subcrops on the erosional surface north of the fields in the area.

Immediately above this MC-2 unit occurs a basal unit of the MC-3, which is termed the "Algal Zone" and which is characterized by altered organic structures resulting in relatively low porosity but high permeability. This algal zone is productive in the northeast end of Alida field where it merges updip into the oil reservoir.

As shown in Fig. 2 the main oil fields of the Mission Canyon trend are



Alida, Nottingham, and Ingoldsby, with North and South Hastings, Rosebank, and the newly discovered Lemieux-Edenvale pool, making up the total of seven fields for the area.

The first major Mission Canyon discovery in the southeast corner of the province was Alida field discovered in November 1954. It had some 27 wells capable of production as of June 1, 1956. The field as presently defined, covers about 2,350 acres, and the wells are spaced on an 80-acre pattern.

A primary gas cap is present, and the wells produce saturated 40° A.P.I. gravity crude from clean oil, transition zone, and algal zone pay sections at a rate of about 1,200 bbl. per day. The oil in place in the field is presently estimated at some 50 million stock-tank barrels.

Nottingham field is the largest in the area, with a total of 39 wells capable of oil production as of June 1, 1956. Production characteristics are similar to those of Alida, and the field produces 33.5° A.P.I. gravity crude at a rate of about 2,200 bbl. per day.

Ingoldsby fiield, third largest in the area, is as yet only partially defined, with most of the drilling to date confined to the MC-5 section of the reservoir at the southwest end of the field.

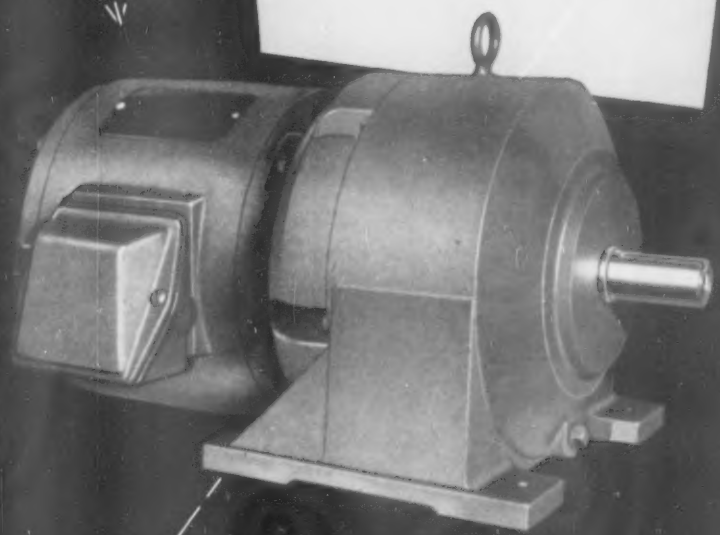
As of June 1, 1956, some 17 wells in the field were capable of production. Two of these produce oil from an MC-5 sand stringer southeast of the main development area of the field, while the remainder produce from the MC-5 or MC-3 carbonate reservoirs. Gravity of the oil is 33° A.P.I. The other fields in the area are smaller and as yet only partially defined.

South Hastings field has six, North Hastings field eight, and the marginal Rosebank field seven wells capable of production. In addition, four wells have been completed in a newly discovered field in the Lemieux-Edenvale area just northwest of Alida. Drilling depth to the top of the pay throughout this development area averages about 3,600 ft.

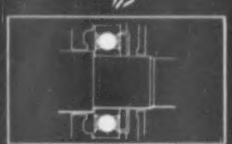
In addition to the defined fields of the area, a series of scattered oil strikes and shows in MC-5, MC-3, and MC-1 rocks in more isolated wildcats has kept exploration focused on this area.

Logging devices most favored in development drilling in these Mission Canyon oil fields are the conventional electrical log in conjunction with the Microlaterolog, and the gamma ray log. A typical field log from this area is shown in Fig. 4. It also includes a type log from the Weyburn-Midale-Frobisher oil field trend. Fig. 5 is a photograph of a series of core samples which includes all Mississippian reservoir rocks discussed here.

Don't overlook what you can't see



You can't always see what makes a gearmotor outstanding. It's the attention paid to small design details that makes the difference. Here are a few of the details that make the new Reliance Gearmotor stand above the rest.



FOOLPROOF METERMATIC motor bearing lubrication and oil bath gear lubrication for long-life protection against wear.

INDUCTION HARDENING of the tough alloy steel gears gives a perfect combination of wear resistance and strength.

SIMPLIFIED GEARING with few moving parts reduces friction losses and lessens chances of breakdown.

THRUST BEARINGS handle heavy overhung loads safely by placing strain on the frame instead of the shafts.

Find out the complete story for yourself — contact your Reliance representative or write for Bulletin E-2408.

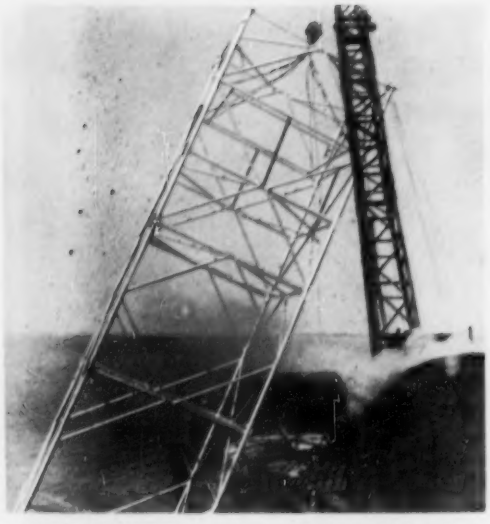
E-1608

REDUCE SPEED

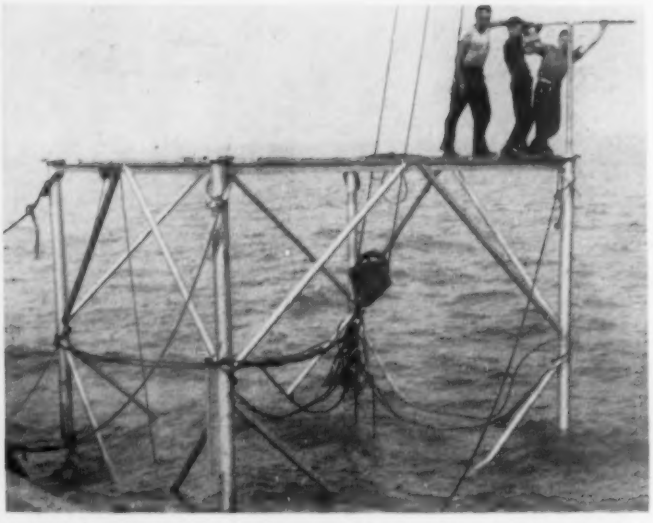
RELIANCE ELECTRIC AND ENGINEERING CO.

CLEVELAND 10, OHIO · OFFICES IN PRINCIPAL CITIES

Canadian Division: Welland, Ontario



LOWERING TOWER from barge. Made of 15-ft. bolted sections, this tower has 4-ft. sq. pads to rest on lake bottom.



TOWER IS ON BOTTOM and crew is leveling with a long handle which turns screw jacks in the bottom of the leg.

CANADA—Where Oil Is King

Here's proof that it can be done:

Cable Tools Drill Offshore

by P. S. Bazett

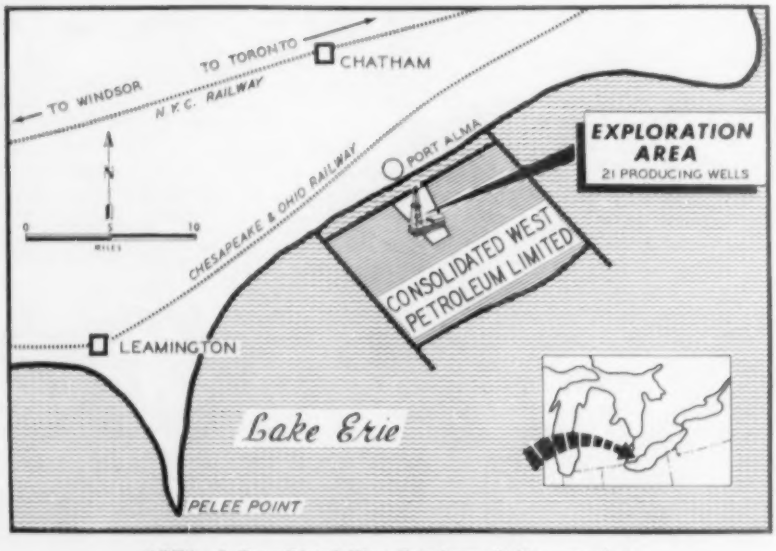
Consolidated West Petroleum has an active drilling program to develop gas reserves in western Lake Erie. Some of the features of their operations are cable-tool drilling from platforms and underwater well heads for completions.

SINCE Consolidated West Petroleum, Ltd., drilled its first well a mile from shore in Lake Erie in 1943, its offshore operations have expanded considerably. This year 22 gas wells averaging over a million cubic feet each are producing from its offshore leases and no dry holes have been drilled. Four drilling platforms are in operation and two more will be added later in the year. About 12 to 15 wells will be drilled this year.

Wells are drilled in water up to 65 ft. in depth at distances of 1 to 4 miles from shore. Gas production from the Salina and Guelph dolomites occurs at 1,050 to 1,350 ft. and all drilling is done by cable-tool machines. Drilling machines operate from portable steel platforms anchored to the lake bottom.

The company is the only one in Canada doing offshore drilling in water up to 65 ft. in depth and so far as is known, the only company in the world which has developed a technique to leave wellheads under water. The wellheads are 30 to 60 ft. from the surface of the lake. Original design and sec-

Author is assistant to the president, Consolidated West Petroleum, Ltd., Toronto, Ont.



AREA of Consolidated West Petroleum, Ltd.'s, operations.

DRILLING

DRILLING PLATFORM in operation. It holds cable-tool drilling machine, sleeping quarters, and cooking facilities.

GAS PRODUCTION from recent wells offshore comes through this 6⅝-in. pipeline. It was welded in 450-ft. lengths and then pulled into the lake.

CANADA—Where Oil Is King

for Rich Canadian Gas Reserves

"Each platform has a four-man drilling crew and a cook, living on the platform. The towers, aside from the drilling machine and tools, are equipped with a propane gas stove, refrigeration, etc."

tional construction of the platforms make it possible to drill at any distance from the shore in western Lake Erie.

Development . . . Consolidated West Petroleum's first well in Lake Erie was near Port Alma, Kent County, Ontario. A wooden platform standing in 35 ft. of water was used in this operation. The well was completed at 1,280 ft. in the fall and measured 900,000 cubic feet of gas daily in open flow and showed a rock pressure of more than 350 psig. The company planned to move the platform before the winter freeze, but was forced to leave it in the lake.

During the winter, floating ice destroyed the platform and ripped off the wellhead. The next spring was spent building a new platform and repairing the wellhead. Apart from the above damage and an iceberg grounding on and breaking one of the 3-in. lines about 1,000 ft. from shore, Consolidated has had no further damage from ice.

From 1945 to 1949 inclusive the company continued to drill from wooden platforms. It completed four more wells located from 1 to 1½ miles from shore in about 40 ft. of water. With five successful gas wells drilled over a distance of 1½ miles, the company felt it was justified in designing and building a portable steel platform to drill in deeper water and cut down the great cost in time and labor in building and dismantling a wooden platform each time.

In 1950 the company experimented with a portable steel tower and platform of its own design and began drilling from this platform in 1951. It operated with one platform until last year, when a second was added.

In 1955 the company stepped up its operations during the May to September drilling season, drilling and completing seven wells, all with good gas production. This brought the company's wells to 19 with a combined potential of 20 million cubic feet daily.

An extension of Tilbury field on land was made. This gas has been found 1 to 4 miles out in the lake. The last drilling of the 1955 season was at a 4-mile stepout where a good gas well resulted.

Consolidated West Petroleum has under lease 20 sq. miles and holds exploration licenses for another 45 sq. miles. A new contract was negotiated last year with Union Gas which allows for increased flows as reserves are proved.

Platform design . . . The drilling platform is very simple in design, essentially a steel scaffold on four legs secured by wire lines attached securely to steel deadmen driven 10 ft. into the lake bottom. The tower is built in sections 16 ft. square and 15 ft. high, with 6-in. tubular steel legs, 3-in. diagonal tubular bracing and light steel "I" beams for the horizontal members.

The legs of each section fit into and are bolted to the next succeeding section. The bottom section has screw jacks in the lower end of the legs and each screw jack ends a 4-ft.-square pad. The platform is 22 by 28 ft. made of structural steel overlaid with a heavy wooden flooring and is leveled by using long wrenches on the screw jacks through the legs.

Quarters . . . While drilling is in progress the drilling crew is taken to and from the platform by a work boat of steel construction and diesel power. All casing for the well and materials are delivered by the same means.

Each platform has a four-man drilling crew and a cook, living on the platform. The towers, aside from the drilling machine and tools, are equipped with a propane gas stove, refrigeration, sleeping quarters, hot and cold

When long-haul communication requirements exceed the practical limits of conventional equipment, the most effective propagation technique is likely to be . . .

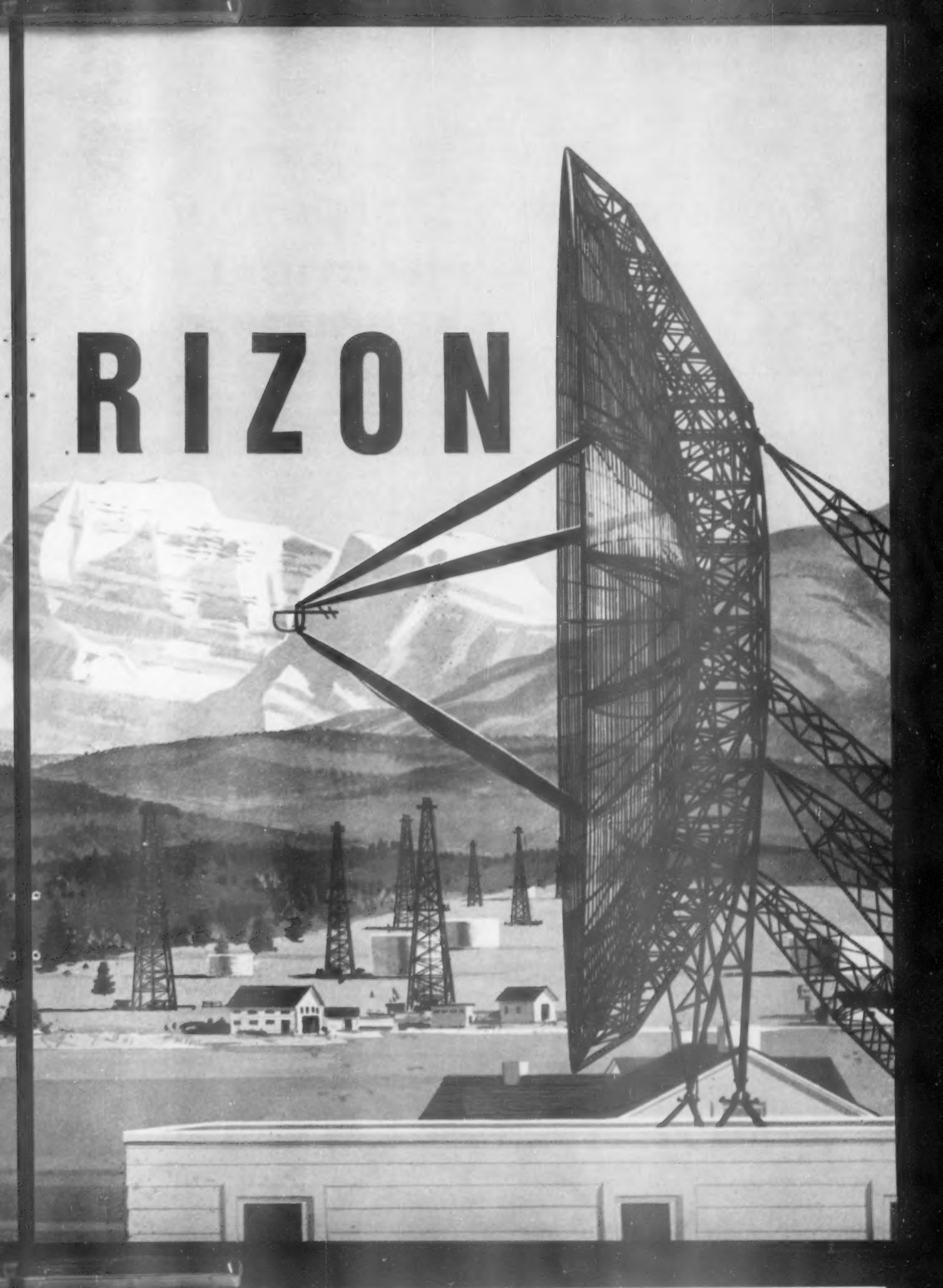
TRANSHO

Topography, climate and maintenance difficulties rule out economical installation of wire line or conventional radio facilities in many areas of Canada. Transhorizon "scatter" systems are ideally suited for long-haul all-weather communication over difficult terrain. Links of 100 to 1,200 miles without intermediate relay stations can tie together widely separated petroleum operations with voice, data and telegraph channels.

Collins engineering services are available for evaluating, planning and installing your integrated communication system.

Collins CREATIVE LEADER IN COMMUNICATION

COLLINS RADIO COMPANY, CEDAR RAPIDS, IOWA • DALLAS
BURBANK • NEW YORK • WASHINGTON, D.C. • MIAMI • SEATTLE
COLLINS RADIO COMPANY OF CANADA, LTD., TORONTO
COLLINS RADIO COMPANY OF ENGLAND, LTD., LONDON


RIZON

For your next project... avail yourself of

PRACTICAL EXPERIENCE

Your industry is increasingly reliant upon process engineering procedures learned far afield. The engineering staff of Stearns-Roger has these resources because of the many areas in which Stearns-Roger is continually engaged: metallurgy, power, atomic energy, chemical processing, and oil and gas processing. These men are ever alert to new designs for more efficient plant arrangement or operation.

Stearns-Roger has for years been closely identified with the oil and gas industry. Processing plants designed and built by Stearns-Roger operate from the extreme cold of Canada to the mild conditions of the Texas Gulf, ranging from the very large to the very small.

Starting with analysis of well-head gas, S-R facilities are complete for handling each successive step through process design, general engineering, fabrication of special equipment in our shops, and field installation with our own personnel. We deliver a completed plant, operating, to meet the customer's long term needs.

TAKE IT UP WITH

Stearns-Roger

THE STEARNS ROGER MFG. CO. DENVER COLORADO

DENVER • HOUSTON • EL PASO • SALT LAKE CITY

Stearns-Roger Engineering Company, Ltd., Calgary, Alberta

running water, and radio telephone.

It is interesting to note that there is no harbor within 10 miles of the company's operations and the work boats, when not in use, are hoisted up out of the water and hung about 200 ft. from shore from power hoists which are connected to the end of the wharf.

Drilling the well . . . When a well location is made the tower is assembled with a height in regard to the depth of the water, and the tower and platform are brought out on a barge. Four tubular steel pile points 10 in. in diameter and 12 ft. long, with two ¾-in. steel cables attached to the top end of each pile point, are then driven into the clay in the bottom of the lake about 200 ft. apart in the form of a square. The cables are attached to floats and the tower is then set on its feet in the center of the square. The platform is put on and leveled and the eight cables from the pile points are taken off the floats and attached to the corners of the tower as guy wires and tightened up with large turnbuckles.

A Bucyrus-Erie drilling machine of the spudder type is placed on the platform and the well drilled to completion. At completion the wellhead is left on the bottom of the lake.

The first casing string on the wells consists of 10¾-in. o.d. which is driven to about 160 ft. If success is achieved in driving this through the clay and gravel drift to drift to the top rock then drilling continues in an open 8⅝-in. hole. If not, a 9⅝-in. liner is inserted before drilling is continued. When it is time to case with 7-in., the 10¾-in. drive pipe is cut off about 6 in. about the lake bottom and two holes are burned through for anchor clamps.

Since the hole is full of fresh water at that time, no protection is needed. The cutting operation is done by a diver with an oxygen electric-arc torch. The company has its own diving staff so that this becomes a routine operation. During the summer a lot of underwater work is done by divers using aqua lungs, but for more extended jobs in connecting up field lines, etc., conventional diving helmets and suits are used.

As the 7-in. casing string is put in the hole the wellhead, including a full-size drilling valve, line valves, etc., are lowered to the lake bottom on this casing.

After a well is finished the cables are detached from the platform, but left on the lake bottom attached to the pile points for further use, if necessary. The platform is then moved to a new location where the process is repeated. The cables can be picked up and attached again to platform during working over or repairing a well at some later date.

Handling water . . . Wells are not equipped with individual pumps, but when water problems are met, tubing, working barrel, and rods are installed from the drilling platform and a portable hydraulic pump is put into action. This pump sits on the top flange of the well and is equipped with two hydraulic rams set vertically across the top with a yoke between them.

A gasoline motor, oil tank, etc., are carried in a boat and when it is necessary to pump a well all that is needed is to snap on the salt-water discharge line. This is a flexible hose running to a discharge tank in the boat. Then the ram assembly is lowered with the hydraulic hoses attached, to the top flange of the wellhead.

This can be done in a few minutes and the pumping operation is no more difficult than it would be on land.

Gas lines . . . The economic study of offshore pipelines involves many factors not usually associated with overland lines the cost is about three times that of a comparable land system. The most important factors affecting the cost in offshore construction of a pipeline are the weather, and marine and diver's services.

The weather becomes even more of a problem and the cost of construction increases as the line progresses out into the lake.

Pipe burial is one of the most controversial aspects of offshore pipelines. Ditching by any method is both slow and costly as compared to land work. The company is, however, studying a method whereby their lines can be buried even deeper into the bed of the lake through the use of water jetting under the lines.

The gas from the first 12 wells the company drilled from 1943 to 1954 was brought to the shore to the Union Gas Co.'s lines by several 3-in. steel lines laid on the the lake bottom. These lines were put together on the shore and pulled into position a mile or more out in the lake, then connected to the wellheads by divers.

Last fall, 2½ miles of 6⅝-in. diameter steel all-weld pipe was welded on land in 450-ft. sections and pulled out into the lake, much the same as is done at river crossings. Each 450-ft. section was welded onto the end of the preceding section before being launched into the lake. Because of the small negative buoyancy of the pipe, can buoys were attached to the pipe at 100-in. intervals to help support the weight.

Since wellheads are at the bottom of the lake, no platforms are available as pulling stations and barges and tugs were used. This is an expensive operation. The ideal answer to marine tie-ins lies in the future, when a satisfactory means of making underwater welds has been perfected. However, the company already makes dry-line connections under water and is experimenting with underwater welding.

With the wellheads and pipelines on the lake bottom, nothing is visible from the lake surface after a well has been completed and the platform removed. But to protect shipping the well is buoyed. To locate a well, a system of cross beacons set up an shore allows for ready triangulation.

RIGGING UP . . .

"When a well location is made the tower is assembled with a height in regard to the depth of the water, and the tower and platform are brought out on a barge. Four tubular-steel pile points 10 in. in diameter and 12 ft. long, with two ¾-in. steel cables attached to the top end of each pile point, are then driven into the clay in the bottom of the lake about 200 ft. apart in the form of a square. The cables are attached to floats and the tower is then set on its feet in the center of the square. The platform is put on and leveled and the eight cables from the pile points are taken off the floats and attached to the corners of the tower as guy wires and tightened up with large turnbuckles."

watch for this trademark...

in CANADA

Soon

Now, WELEX JET SERVICES, INC., famous originators of the jet process and the leading jet perforating company in the petroleum industry, offers its full services in Canadian oil fields through WELEX OF CANADA, LTD. Under this familiar sign will be found the finest trained technicians, the latest wireline tools and equipment, advanced techniques and know-how. This means *better* service . . . *faster* service . . . *safer* service for the Canadian petroleum industry.

Welex of Canada, Ltd.

A subsidiary of Welex Jet Services, Inc., Fort Worth, Texas

D.S.T. IN CANADA

Current trends and equipment

Drill-stem testing in Canada, not yet 20 years old, was not generally used until Leduc in 1947. Here's a rundown on some of today's practices.

by R. A. Pitman and A. R. Potter

THE first drill-stem testing to be conducted in Canada was some hook-wall testing inside casing performed in Turner Valley field in 1937. Some time later that year the first formation testing was conducted in the Princess area of southern Alberta. A straight J-type tester was used with a rubber and fabric-type packer attached only at the top.

These were primarily full-hole tests in 9⅝-in. hole, using 8¾ and 9-in. packer rubbers. The first bottom-hole pressure-recording devices were introduced at about this time; their primary purpose being to supply information regarding the mechanical operation of the testing tool. Testing was carried out in the Vermillion-Lloydminster areas in about 1940. Testing in these areas was considered to be quite elementary and did not present any unusual problems.

The drill-stem testing operation carried out on the discovery well at Jumping Pound in 1942 was at that time the deepest well ever to be tested in the British Empire. Later however, the discovery well at Pincher Creek surpassed this record. Testing did not become too widely accepted however, until the discovery of Leduc in 1947. Since then drill-stem testing in Canada has been used extensively in the exploration for oil and gas.

Current trends in testing . . . In the past couple of years, drill-stem testing in Canada has declined, probably because of a decrease in activity with respect to wildcat drilling wells. On development wells, the use of drill-stem testing techniques has been restricted somewhat to the location of water tables or gas caps. This was particularly the case during the development phases of Camrose-Armena field in Alberta.

In the Pembina area, drill-stem tests are very inconclusive when attempting to evaluate the Cardium section. The Belly River is being tested occasionally throughout the field; on wells being drilled on down below the Cardium, a fair amount of testing is being conducted through the Viking and Mississippian formations.

Drill-stem testing has been stimulated in the past few months with respect to the evaluation of gas reservoirs. Because of improved market outlets there has been a considerable increase in the exploration and development of potential gas fields. In the Fort St. John area of northeastern British Columbia drill-stem testing is being used very extensively to determine the approximate potential of several gas zones which are encountered in that vicinity.

The southern area of Alberta also is actively engaged in exploration for gas. There is considerably more testing conducted on gas wells than on most oil wells being currently drilled.

Low-permeability oil-producing fields which require stimulation such as hydraulic fracturing, do not yield sufficient recovery to be conclusive. Therefore in fields such as Pembina in Alberta and Daly field in Manitoba, drill-stem testing is of a minimum. There is however, a fair amount of activity in southeastern Saskatchewan where both the Charles and Mission Canyon members of the Mississippian are somewhat unpredictable although potentially good oil reservoirs.

Testing will in general indicate whether or not a commercial producer can be expected as well as being a very useful guide in locating the oil-water interface.

One operator in Canada has been reasonably successful in drilling to total depth, logging, and testing up the hole using straddle packers. This technique has not been adopted very widely although it definitely may have some attractive advantages.

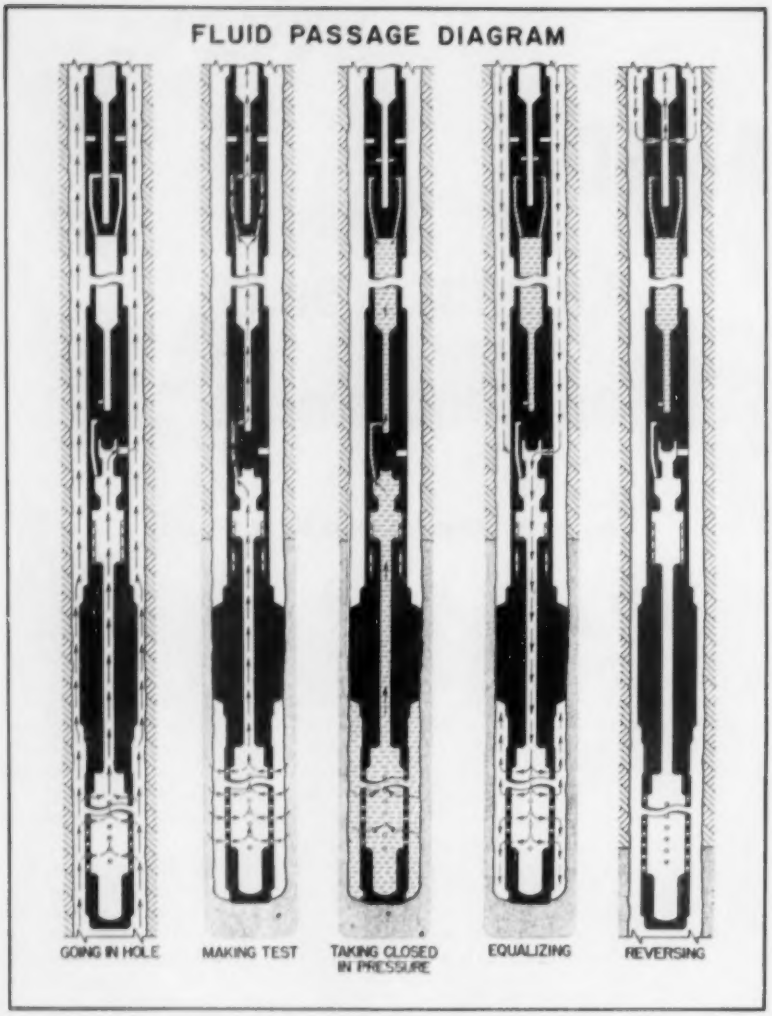
Testing in casing has not been practiced very extensively other than that of a dry test after squeeze cement jobs, etc. Occasionally hook-wall tests are run to pick up water-oil or gas-oil contacts. There are no conditions known in which it is necessary to set casing because of hole conditions to evaluate by drill-stem testing.

Testing Techniques

- **Rathole or core-hole testing**—testing in a smaller-diameter hole than that of the main-bore hole.
- **Full-hole testing**—testing in the main or full-diameter hole.
- **Open-hole testing below casing**—testing in the rathole or core hole below the pipe or setting a hook-wall up in the casing and testing the whole interval below.
- **Straddle testing**—straddling a zone up the hole as in the case of where a prospective zone had been missed on the way down and later picked from an electric log analysis.
- **Testing in casing**—using a hook-wall packer assembly set above the perforations or straddling one particular set of perforations. This is frequently done to test a squeeze job or evaluate a potential productive zone.

New testing technique . . . The trend in testing in recent years has been to

Authors are with Halliburton Oil Well Cementing Co. Ltd., Calgary



HERE IS HOW the fluid moves during the various phases of a drill-stem test. Fig. 1.

that of full-hole testing, thus saving considerable rig time. Improved control of mud and hole conditions has made this practice more acceptable. Recently a new testing technique has been practiced more extensively in Canada, that of up-the-hole straddle testing. This technique has proved quite successful due to the care taken in the selection of packer and slip seats. The best success has been where seats have been located in limestone and sandstone formations. The success ratio has been improved considerably by checking a caliper log whenever possible to determine where to set the packer.

The use of straddle packer-flush joint bypass equipment is almost always run in conjunction with this type of testing. As well as the other advantages previously mentioned, probably the most attractive is that of decreasing the load supported by the packers. (See Example 1).

Anchorless testing equipment has almost completely replaced the old conventional method of straddle testing with blanked-off anchor to bottom. This method of up-the-hole testing has been 93 per cent mechanically successful. Five per cent of the unsuccessful runs have been because of tight-hole conditions where it was impossible to lower the testing equipment to the zone being tested. Two per cent of the failures were due to no packer seat.

This tool is very versatile in that it has been used in other areas to selectively acidize and test open-hole formations.

Water cushions have been used fairly extensively in Canada, although primarily to prevent collapse of drill pipe on deep tests due to high external mud pressures. This is the practice of placing a predetermined amount of fluid in the drill pipe above the testing tool, depending on the depth of the test interval and the pressures anticipated.

CANADA—Where Oil Is King

In the Pincher Creek area, diesel fuel is used as the cushion for testing the high-pressure gas reservoir which is encountered in that area.

Double closed-in pressures . . . The practice of running double closed-in pressures is becoming increasingly popular. This procedure provides for the taking of initial closed-in pressure before the flowing test as well as a final closed-in pressure after the flowing period.

The value of the initial closed-in pressure is that the formation pressure buildup will more nearly approach static-formation pressure during this time interval in that the formation has not been disturbed or partially depleted. The initial closed-in pressure curve then gives a more accurate evaluation of the virgin formation. Additional information can be obtained by comparison of the final and the initial closed-in pressure curve.

This technique is accomplished by the installation of a disk valve in the drill pipe above the tester valve, thus providing an air chamber into which the mud between the packer may flow when the packer is seated and the tester valve opened. The volume of this air chamber is of utmost importance in obtaining an accurate initial closed-in pressure buildup curve.

This must be great enough to relieve the hydrostatic pressure from the formation, yet it must be small enough to permit a very limited amount of production from the formation. The volume of this air chamber should be between 10 and 15 per cent of the volume of mud between the packer and the bottom of the hole. In order to properly locate the position to insert the disk sub, it is necessary to make a calculation as follows:

Drilled hole size, in.	8¾
Total depth, ft.	6,872
Packer depth, ft.	6,840

Calculate the volume of the hole below the packer, which in this example is 32 ft. Refer to capacity tables and find 8¾-in hole which shows .0744 bbl. per linear foot which gives .0744 by 32 ft. = 2.38 bbl. It is necessary to allow between the tester valve and the disk sub, not less than 10 per cent and not more than 15 per cent of the calculated volume. Therefore, 10 per cent of 2.38 bbl. = .24 bbl. Assuming that the testing string of drill pipe in 3½ in. A.P.I. FH which has a capacity of 135 ft. per barrel, the disk sub by calculation should be located 135 ft. by .24 bbl. or not less than 32 ft. above

Over
60
Locations in the United States and Canada

McCullough® REPORTS TO THE OIL INDUSTRY

Service
Anywhere Anytime

New Services • • • New Tools • • • New Methods • • • Outstanding Results

NOW AVAILABLE – *Technical paper "A Method for Neutron Derived Porosity Determination for Thin Beds". Write McCullough Tool Company, 5820 South Alameda St., Los Angeles 58, California.*

McCullough Log Enables Precision Perforating of 5' Pay Zone

Discovers 8' Error in Electric Log and Casing Measurements

Operator of this old well ran an electric log which located a new, possibly productive, 5' sand.

McCullough was then called to run a Neutron Log. The Neutron curve confirmed the productive possibilities of the new zone, but also discovered that both the electric log and casing measurements were 8' in error.

The well was plugged back to 6800' and perforated according to McCullough measurements.

Thirty ½" improved Ogival Bullets were shot in the 5' sand in one run by a 3½" O.D. McCullough M-3 Gun. Casing was 5½" O.D. 17 lb.

The well started flowing through the casing before the M-3 Gun was out of the hole.

If the McCullough Radiation Well Logger had not discovered the 8' measurement error, the 30 shots would have missed the pay zone entirely.

It always pays to rely on the accuracy and dependability of McCullough's Radiation Well Logger.

McCullough Log Locates and Defines 11 New Pay Zones

Accuracy of McCullough Radiation Well Logger Permits Sharp Shooting of 11 Thin Zones for 138 B/D Increased Production

This was an old well in an established California oil field. Production had fallen to five barrels of oil per day.

Believing better production was possible, the operator decided to log and re-perforate the well. McCullough's combination Gamma Ray-Neutron Log was run from 4380' to 5645', locating several small, promising stringers of untried sands above the original pay zones.

A simultaneous collar log accurately located casing collars in relation to these thin sands, thus assuring "pin-point" accuracy in perforating.

The two original producing sands were re-shot, four holes per foot, with 26 improved ½" Ogival Bullets from McCullough M-3 Guns and with 26 McCullough Standard Casing Glass Jets.

Above these zones were the 11 small sand stringers ranging in thickness from 4 feet to 13 feet. Intermediate zones, lying between the productive sands, which were not to be perforated ranged in thickness from 5 feet to 103 feet.

Accurate measurement means "putting the shots where they count"... and the "pin-point" accuracy of the McCullough Radiation Well Logger makes sharp shooting of thin zones practical... assures uniform perforating coverage of any zone, thick or thin.

The 11 pay sands were perforated with 256 shots, four holes per foot, by 3½" O.D. McCullough M-3 Perforators firing ½" Ogival Bullets. Production increased from 5 to 143 barrels of oil per day.

This is only one of many actual jobs where the accurate, reliable, easily interpreted information provided by the McCullough Radiation Well Logger has located and defined multiple pay zones, tied-in casing collar locations and permitted precision perforating for best possible production.

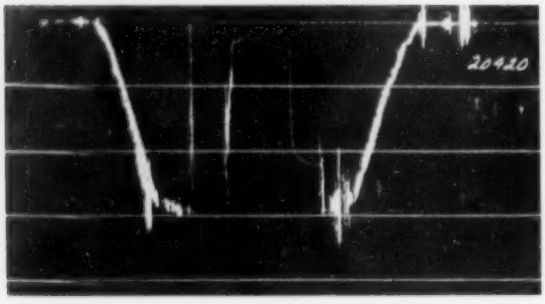
McCullough® TOOL COMPANY

Cable Address MACTOOL

LOS ANGELES
HOUSTON
EDMONTON

NORTHERN CHURCHILL	17-54	5	NORTHERN OIL COMPANY	FT. NELSON
(Lease)	(Well No.)	(Test No.)	(Company)	(District)

Location	54-42-19-24-W7	Halliburton — Oil Well Cementing Co. Ltd.		Date	19-23-54
Field	Wildcat			Ticket No.	21426
County	British Columbia			HOWCO District	Ft. Nelson
State	Canada	HOLE AND TOOL DATA		Kind of Job	Open Hole Test
Contractor	Dawson Drilling Co.	Total Depth 5527'	Casing Perforations Top — Bottom —	Price	-
MUD DATA		Top Packer Depth 5498'	Bottom Packer Depth 5501'	Second Packer Assembled	-
Kind	Oil Emulsion	Casing or Hole Size 8 3/4"	Liner or Rathole Size -	Safety Joint	-
Weight	10.2 lbs./gal.	Formation Tested D-3		Extra Packer Charge	-
Viscosity	95 Sec.	Size Drill Pipe 4½" FH	Size Drill Collars 6¼" x 26'	Jars	-
Filter Loss	4.3 c.c. Filter Cake 2/32 in.	Size Bottom Choke 5/8"	Size Surface Choke 3/4" adjustable		
Rm. Gauge Depth Temp.	Cal. 150° F°	Size Mech. Well Packer -	Size Rings	No. Rings -	
Time Tool Open	60 Minutes	Size O.E. Well Packer 7¾" Ex. Shoe		No. Packers 2	Total
Time Closed In	30 Minutes - Initial 30 Minutes - Final	Size & Length Anchor 4½" x 20'			Witnessed By J. Nelson
Depth BT. Gauge	5487 Ft.	PRD Device No. 1724	Depth 5522'	Blanked Off Yes	Tester D. Hanson
BT P.R.D. No.	459 Blanked Off No	REMARKS	Packers seated, tool opened for 30 Minute Initial closed in pressure.		
12 Hr. Clock No.	2999		Dropped bar, broke disc and received good initial blow, gas to surface		
Pressure Readings	Field / Office Corrected		in 13 minutes, increasing near end of test interval. Final C.I.P. taken.		
Initial Hydro. Mud Pressure	2920 / 2939 p.s.i.		Pulled loose after jarring for 15 minutes. Recovered 20' mud, 40' oil-		
Initial Flow Pres.	440 / 437 p.s.i.		cut mud, 1150' crude, highly gas-cut.		
Final Flow Pres.	465 / 444 p.s.i.				
Closed In Pres.	2365 INITIAL 2210 FINAL / 2332 2219 p.s.i.				
Final Hydro. Mud Pressure	2920 / 2923 p.s.i.	Amount of Cushion Nil	All depths measured from Kelly Bushing	No. Folders Requested	5



TYPICAL DATA from a drill-stem test where double closed-in pressures were run. Pressure graph at left, pertinent well data and test information above. Fig. 2.

CANADA—Where Oil Is King

the tester. Since this is longer than one single joint of drill pipe it would be necessary to run 2 joints of drill pipe between tester and disk sub.

If a water cushion is used, there must also be the same amount of calculated volume as above between the water cushion and the disk sub—the sub, of course, being run above the cushion.

At the conclusion of the initial closed-in pressure period the disk valve is opened by dropping the bar, shearing the disk and allowing the formation to produce for the desired time interval. At the end of this flow period the formation is again closed in by a mechanical closed-in pressure valve thereby obtaining the final closed-in pressure buildup curve. (Fig. 2).

A special reading is made on charts having dual C.I.P. curves whereby the pressure curve is divided into a specified number of equal increments This data is tabulated and can be later used in the various formulas for reservoir evaluation. (See Fig. 3). All the pertinent data with respect to the well and formation being tested is recorded by the testing operator, thereby giving a complete report of every phase of the drill-stem testing operations. Modern up-to-date laboratories are available to the operator for analysis of all drill-stem-test recoveries without charge.

Planning a D.S.T. . . . Certain factors have to be carefully considered when a drill-stem test is anticipated. A reliable service company should be employed, which is equipped with modern, proved, dependable equipment. The hole and mud should be thoroughly conditioned just prior to the running of the drill-stem test.

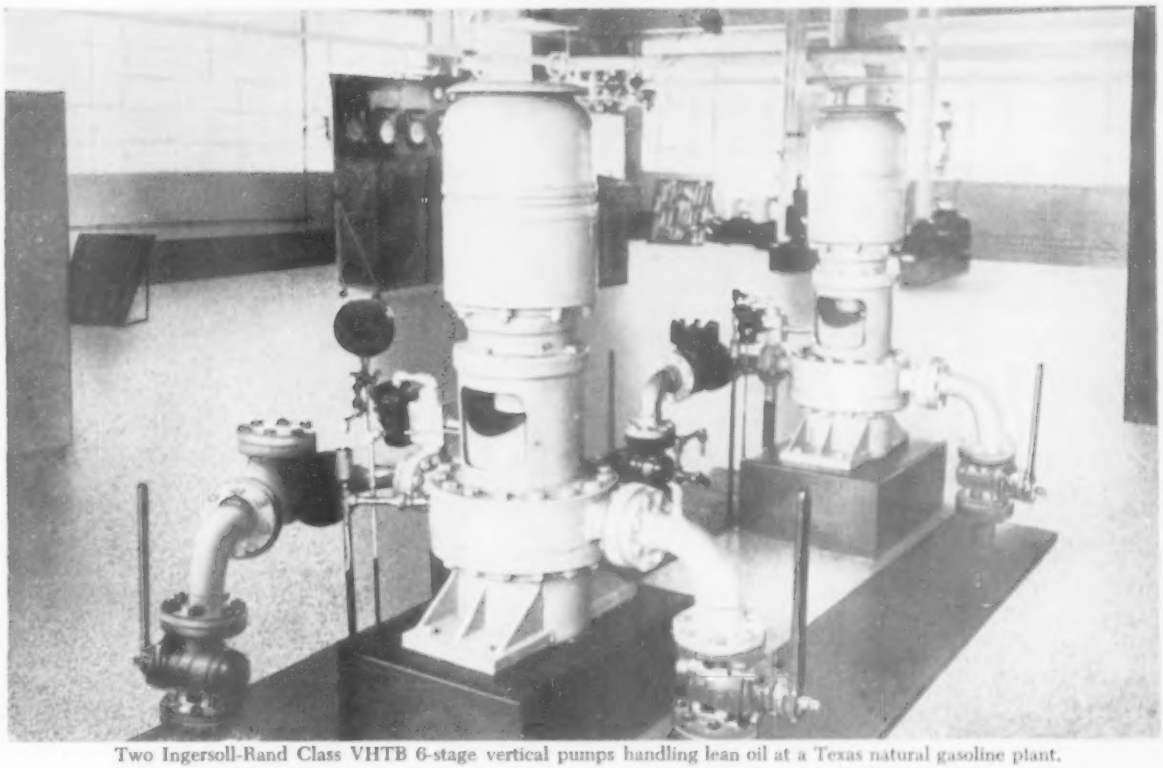
The testing service company should be given all the pertinent information pertaining to the type of test to be run so that proper tools can be furnished which will ensure the greatest degree of success. This includes such information as: the type of job to be run, size of hole to be tested, amount of hole to be tested, packer size or sizes, choke sizes, type and location of the circulating sub, size and type of drill pipe and drill collars, use and type of jars preferred, and any other special information pertaining to the test.

Careful consideration should be given to the selection of the packer seats. Considerable difficulty is encountered when packer rubbers are seated in soft shaly formations, particularly those which wash out readily while drilling through. Sandstone and limestone formations which have been found to conform to gage hole furnish the most reliable packer seats.

It has been advisable in some cases to sacrifice at least 2 ft. of sand to be tested to minimize misruns. Drill-pipe tallies should be carefully checked and testing strings measured together with proper packer spacings to indicate when true bottom has been reached. This will overcome any difficulties that may be encountered by opening the tool prematurely.

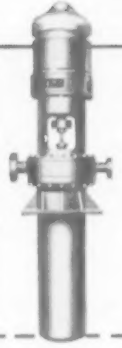
Testing tools should be lowered to the bottom of the hole slowly to allow proper bypassing action. Visual checks on the mud level in the annulus should be made from time to time to determine that mud is not entering the drill

VERTICAL PUMPS



Two Ingersoll-Rand Class VHTB 6-stage vertical pumps handling lean oil at a Texas natural gasoline plant.

to lower your pumping costs



CLASS VHTB
Pressures: to 1500 psi
Capacities: 25 to 325 gpm
Temperatures: to 750°F.

Vertical, multi-stage diffusor-type unit. Single-suction impellers mounted back-to-back for axial hydraulic balance. Stuffing box under suction pressure.

For low capacities at high heads on process, boiler feed, hydraulic and similar applications.

CLASS VP
Pressures: to 750 psi
Capacities: 10 to 350 gpm
Temperatures: to 750°F.

Vertical, multi-stage, diffusor-type construction. Single-suction impellers with throttling sleeve balancing device to reduce axial thrust and provide suction pressure at stuffing box. Entire pumping element removable without disturbing suction and discharge piping.

For low capacities at medium high heads on applications such as process, boiler feed, and heater drain work.

Designed specifically for low-capacity high-head applications, these Ingersoll-Rand vertical process pumps are engineered with a background of process pump experience. They are manufactured in the most modern of pump plants to deliver years of efficient service with a minimum of down time and maintenance expense.

Features include: "Double-Case" construction with segmented diffusor-type inner casing for complete radial hydraulic balance and minimum bearing wear... Positive aligning feature for perfect positioning of inner casing segments... Rotor assembled without prestressing shaft to eliminate all possibility of shaft distortion. Available in bronze fitted, all iron, carbon steel, and stainless fitted materials to cover a wide range of process services.

Ask the Ingersoll-Rand engineer to show you these and other features which make Ingersoll-Rand pumps your best bet for low cost year-in, year-out service.

Ingersoll-Rand

10-376 11 BROADWAY, NEW YORK 4, N.Y.

COMPRESSORS • GAS & DIESEL ENGINES • AIR & ELECTRIC TOOLS • CONDENSERS • PUMPS • ROCK DRILLS • VACUUM EQUIPMENT

FOR CANADA, REFER TO CANADIAN INGERSOLL-RAND COMPANY, LIMITED, BIRKS BUILDING, MONTREAL, QUEBEC.

Company HUDSON BAY OIL AND GAS COMPANY Date 5-23-56

Lease HUDSON BAY UNION LIBERAL Well No. 9-6 Ticket No. 20420

Test No. 6

	Time	PSI
Initial Hydro Mud Pressure		2939
Initial Closed In Pressure	30 Mins.	2332
Initial Flow		437
Final Flow	60 Mins.	444
Final Closed In Pressure	30 Mins.	2219
Final Hydro Mud Pressure		2923

Total Depth 5527'

Packer Depth 5498'-5507'

BT No. 459 Depth 5487'

12 Hr. Clock No. 2999

Temperature Corrected to Calc. 150 °F.

	Initial CIP			Flow Pressure			Final CIP		
	Time Defl. .000"	PSI Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Defl. .000"	PSI Temp. Corr.	Time Defl. .000"	PSI Defl. .000"	PSI Temp. Corr.
P0	.000	.016	41	.000	169	437	.000	.172	444
P1	.0215	.880	2260	.090	100	258	.020	.772	1985
P2	.043	.900	2311	.180	125	323	.040	.808	2077
P3	.0645	.904	2321	.270	150	388	.060	.826	2122
P4	.086	.906	2327	.360	172	444	.080	.838	2153
P5	.1075	.908	2332				.100	.846	2173
P6	.129	.908	2332				.120	.852	2189
P7	.1505	.908	2332				.140	.857	2202
P8	.172	.908	2332				.160	.860	2209
P9	.1935	.908	2332				.180	.864	2219
P10	.215	.908	2332				.200	.864	2219
	3 Minute Intervals			15 Minute Intervals			3 Minute Intervals		

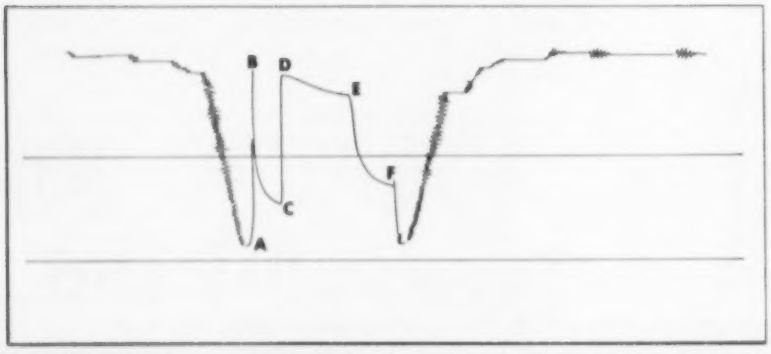
Remarks:

TABULATED DATA from dual closed-in pressure curves are extremely useful in evaluating a reservoir. These figures were obtained from test shown in Fig. 2. Fig. 3.

pipe through a leaky tool joint or testing tool.

Upon reaching true bottom the control head and surface flow lines should be laid to the flare pit. Care should be taken to use adequate line when making up surface equipment such as control head and flow lines. Allow sufficient drill pipe above the table so that the testing string can be picked up with a minimum of delay, to close the tester valve in case of an emergency.

Special precautions should be taken to ensure that the flow line is securely staked down in case of a sudden gas surge. Safety measures regarding no smoking, open fires, motor exhausts, etc., should be closely adhered to during the drill-stem test. During winter operations, extra care has to be taken to inspect for frozen flow lines and ice blocks in surface equipment; all unions and Chiksans should be checked carefully prior to the opening of the tester valve. The packers are then seated by applying partial weight of the drill pipe, usually between 20,000 to 30,000 lb.



PRESSURE CHARTS show if the drill-stem test was successful. A. Tester valve opened. B. Mud pressure relieved—formation-pressure buildup starts. B.-C. Initial closed-in-pressure buildup curve. C. Auxiliary valve opened. D.-E. Flowing-pressure curve. E. Closed-in-pressure valve closed. E.-F. Final closed-in-pressure buildup curve. Fig. 4.

CANADA—Where Oil Is King

The use of the new type expanding shoe packers have given excellent performance in obtaining packer seats in oversized hole and have also been found to pull loose with a minimum of difficulty and less packer damage. During the closed-in pressure intervals and flow periods, it is highly important that accurate time checks be recorded and shown on the data sheet. This exact data is particularly important for the extrapolation of formulas pertaining to reservoir evaluation. If oil reaches the surface during the flow period, the general practice is to reverse circulate the oil from the drill pipe by opening the pumpout sub.

When using this device, care should be taken to keep the annulus mud level full at all times. At the conclusion of the final closed-in pressure buildup period, the testing string is raised slowly to allow the testing valve to close and the bypass parts to open, thus equalizing the hydrostatic mud pressure above and below the packer. The annulus should be checked and filled periodically while removing the testing string from the hole. A careful check should be made to see that no swabbing is taking place.

Testing problems . . . Very few unique problems are encountered when testing in Canada. Depth conditions vary from 1,100 to 14,000 ft. Some difficulties have been experienced in testing an unconsolidated sand in southwestern Saskatchewan. This particular sand results in water recovery that brings the hole in and sticks the anchor.

Some heaving shales and fractured limestones are encountered occasionally, which present somewhat of a problem in obtaining conclusive results. The Viking and Belly River (Cretaceous) sands are usually quite difficult to test because the shales above and below wash out very badly.

As a result, these have been among the most difficult zones to evaluate by drill-stem testing. The practice of testing long intervals has not been too prevalent but is encountered occasionally. This is hazardous from the stand-

are man-hours slipping through your fingers?

P-A-X Business Telephone Systems cut this loss

These are some of the oil companies saving man-hours with one or more P-A-X Business Telephone Systems!

Atlantic Refining Company, since 1923, 1,642 telephones.
Cities Service Oil Company, since 1914, 222 telephones.
Humble Oil and Refining Company, since 1929, 1,525 telephones.
Phillips Petroleum Company, since 1939, 447 telephones.
Shell Oil Company, since 1919, 2,400 telephones.
Union Oil Company of California, since 1941, 1,555 telephones.

When your people have to walk about to exchange information, they're wasting time—through no fault of their own! What you need is a P-A-X Business Telephone System, providing "touch-of-a-dial" communication to the office next door—or 'way in the next division!

Through the P-A-X System, each person can reach anyone else—in seconds. Overall supervision is made easier, and all departments can coordinate their activities for top efficiency. That's why many oil companies depend on P-A-X for lightning-fast communication throughout the length and breadth of their widespread operations.

Rent-free P-A-X is company-owned and controlled; your own communications men install and move P-A-X telephones as you wish. It is rent-free, entirely separate from the public telephone system, and uses company-owned or leased lines.

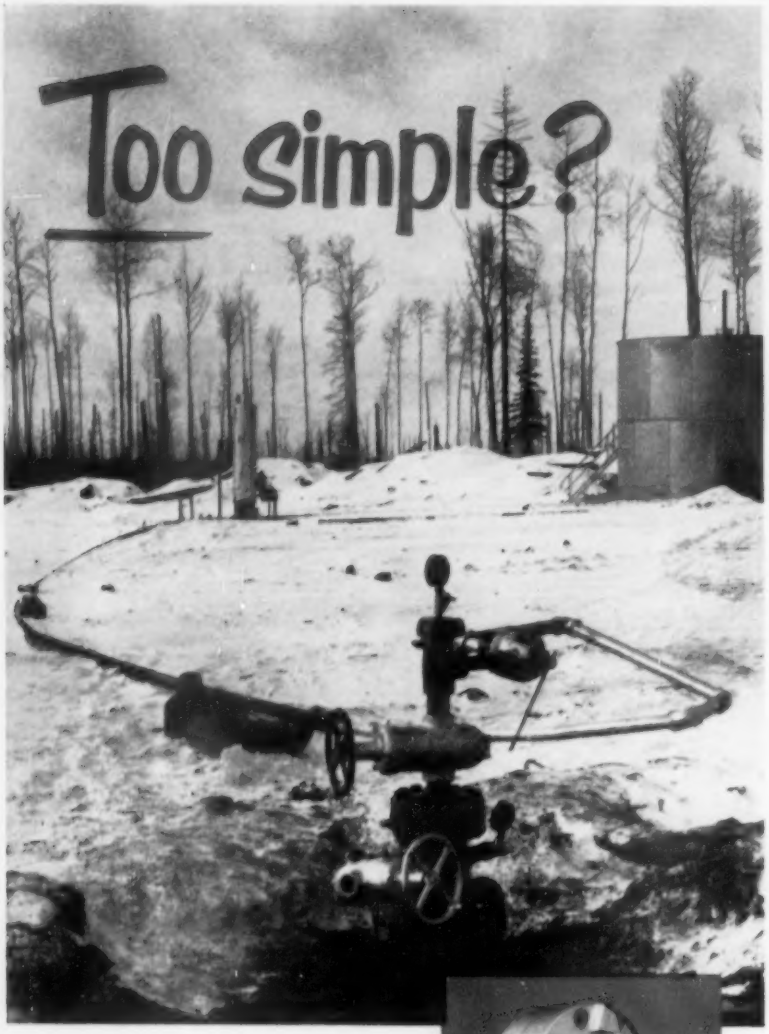
Discover how other oil companies are saving time and money, increasing efficiency, with a P-A-X Business Telephone System. For an actual "on-the-job" case study, *write:* Automatic Electric Sales Corporation (HAymarket 1-4300), 1033 West Van Buren Street, Chicago 7, Illinois. *In Canada:* Automatic Electric Sales (Canada) Ltd., Toronto. *Offices in principal cities.*

Howard L. Housley	M. G. Gnau	L. C. Wiley
Tel.: Prospect 1470	Tel.: JEfferson 1-2520	Tel.: 2-9032
Dallas, Texas	St. Louis, Mo.	Brownwood, Texas

AUTOMATIC ELECTRIC

Originators of the dial telephone • Pioneers in automatic control

GENERAL TELEPHONE SYSTEM



In the northern frontier of Alberta, the two-valve, uncomplicated Christmas tree of the Union Oil Company well "Red Earth 12-17" loafs along at 200 BPD, reduced from a tested 960 BPD, through a

WILLIS
Rotary Adjustable Choke

Adjustable Flow Control with Pre-determined Accuracy

Willis Rotary Adjustable Choke provides 6 different size choke inserts which are individually positioned in the line of flow by a fractional turn of the orifice-carrying disc . . . while under constant flow and high pressure. Simplicity of this uncomplicated Christmas tree (note deletion of wing valve) is accomplished by using a blank orifice in one of the 6 positions of the Willis Rotary Choke. Also without closing the master valve shut-in of the well can be effected.

WILLIS OIL TOOL COMPANY

3440 Pine Avenue, Long Beach, California
Houston: P. O. Box 12164 Park Place Station; Odessa: P. O. Box 412;
Canada: Precision Oilfield Service, Edmonton, and all leading supply stores

point of sticking the packer or anchor, particularly where heaving shale conditions exist, as well as yielding inconclusive data. Slim-hole testing has accounted for more than its share of difficulties, particularly in soft sands. This is probably due in part to the fact that a limited amount of rubber is available when using the small packers required for these conditions.

Results . . . The intelligent interpretation of the pressure charts and fluid recoveries obtained during the drill-stem test can yield very valuable information for future reference. The most important of all the data recorded is undoubtedly that of the pressure chart. Of primary importance of course is the evidence which it supplies regarding the validity of the test.

A typical chart is shown in Fig. 4. At point A, the testing string is on bottom. At this point a clear recording of the hydrostatic weight of the drilling fluid can be obtained. At B, the tester valve has been opened, A to B denotes a decrease in pressure from hydrostatic to the point where the formation pressure assumes control and produces into the air chamber provided, thereby depicting an initial closed-in pressure curve. (B C).

At C the disk sub is ruptured, allowing the formation to produce into the empty drill pipe (D—initial flow pressure). At point E the C.I.P. valve is closed, this point being read as the final flow pressure. The line E-F is the final formation buildup pressure curve and is referred to as the final closed-in pressure at point F. The main testing valve is then closed and the bypass opened allowing the hydrostatic mud weight to be applied to the formation and equalized across the packer. Decreasing pressure versus time is then recorded as the tools are pulled from the well bore.

The data obtained from similar charts are being experimented with by the research departments of many major oil companies. This technique is being utilized quite extensively in Canada at present, with encouraging success. Extrapolated static formation pressures have been obtained which check out very well with other accepted methods. It is also possible to estimate fairly successfully skin effect, effective permeability of the tested interval, and/or evidence of a nearby fault.

Another use is that of the plotting the extrapolated static pressures on contour maps to locate displaced oil pools. Some consideration has also been given to the use of this data in picking gas-oil contacts and water-oil contacts by extrapolated bottom-hole pressure gradients. It will be possible to derive considerably more valuable reservoir

PROTECTED with KONTOL

Kontol effectively protects a wide variety of refinery equipment. In a typical depropanizer application in an eastern refinery, Kontol's detergent action permitted the running time to be doubled. After eight months of Kontol usage, corrosion in overhead condenser was not measurable, heat transfer coefficient was increased by 33⅓% and tower tray corrosion was eliminated. Get similar benefits for your refinery. Your Kontol service engineer will gladly show you how and where.

KONTOL CORROSION PREVENTIVES ARE EFFECTIVE IN

Crude Stills • Depropanizers • Debutanizers • Depentanizers • Absorbers • Stabilizers Platformers • Reformers • Vacuum Towers • Alkylation Plants • Coking Systems • Dewaxing Systems • Gas Recovery Systems • Cat Cracker Fractionators Alkanolamine Sweeteners Desulfurization Systems

TRETOLITE COMPANY

A DIVISION OF PETROLITE CORPORATION

369 Marshall Avenue, Saint Louis, Missouri • 5515 Telegraph Road, Los Angeles 22, Calif.

PETROLITE LIMITED, 120 MOORGATE, LONDON EC2, ENGLAND

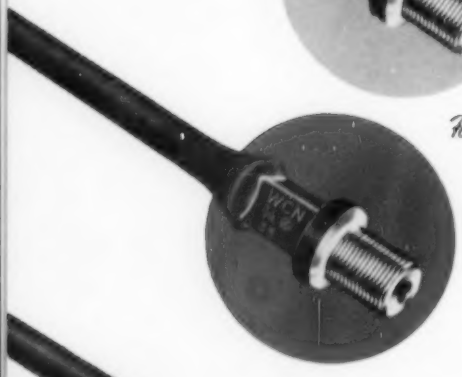
KR-568

Well Developed...

SUCKER RODS

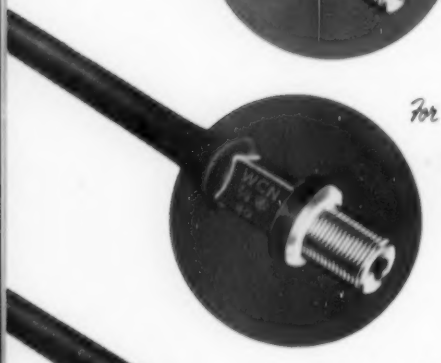
For Heavy Duty - Light Corrosion

NORRIS TYPE 30
CARBON MANGANESE SUCKER ROD



For Medium Heavy Pumping - Med. Corrosion

NORRIS TYPE 35
NICKEL CHROMIUM MOLYBDENUM ALLOY SUCKER ROD

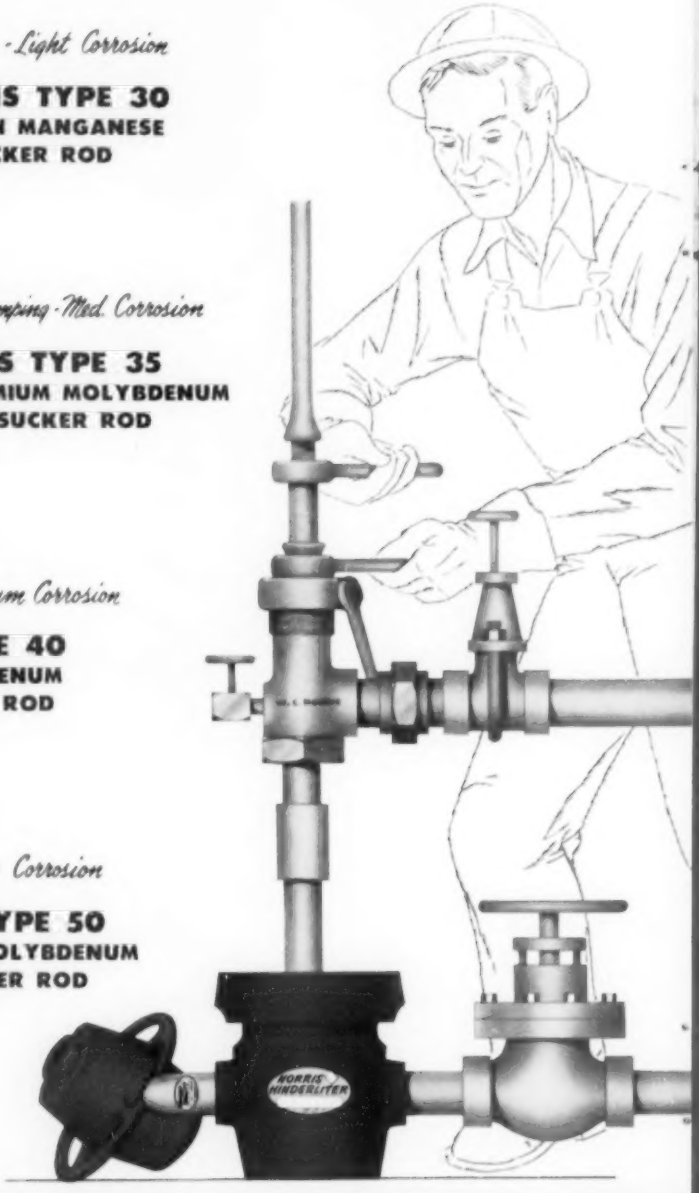


For Heavy Duty - Medium Corrosion

NORRIS TYPE 40
NICKEL MOLYBDENUM ALLOY SUCKER ROD

For Heavy Duty - Severe Corrosion

NORRIS TYPE 50
HIGH NICKEL MOLYBDENUM STEEL SUCKER ROD



Your SUPPLY STORE IS OUR DISTRIBUTOR

W.C. NORRIS MANUFACTURER, INC.

TULSA, OKLAHOMA

BRANCHES:
GREAT BEND, KANSAS; CORPUS CHRISTI, HOUSTON, KILGORE, ODESSA, WICHITA FALLS, TEXAS;

Since NORRIS 1882

OKLAHOMA CITY, OKLAHOMA
SALEM, ILLINOIS; CASPER, WYOMING;

WEST COAST DIST.: REPUBLIC SUPPLY CO. OF CALIF., LOS ANGELES

information from drill-stem-testing techniques.

How Drill-Stem Test Works

Surface equipment . . . A control head is installed at the top of a string of drill pipe. This consists of a stop cock, swivel, Chiksans, high-pressure hose and connections for a surface-adjustable choke, and the kelly joint. The main purpose of this equipment is to control the flow of oil or gas from the drill pipe at the surface to the flare pit. This equipment also permits drilling mud to be pumped into the drill pipe to control the well pressures to circulate through a subsurface packer, or to reverse circulate and remove the entrapped formation fluids. The adjustable choke can be used to control rate of flow of the fluids being produced during the test.

Testing tools . . . There are currently two different types of testing tools being used. They are the hydraulic type and the mechanical type of tool. The hydraulic tool is actuated by the application of weight to close the bypass and open the tool; a delayed time interval gives a positive indication at the surface. These tools are constructed to combine the bypass and the tester valve, resulting in a shorter tool, simplifying and coordinating a closing of the bypass and the opening of the tester valve.

The mechanical tool is operated by rotation of the drill pipe and mechanical manipulation to open the main valve. It is necessary to have a separate bypass tool when using this type of tester. The primary purpose of the bypass is to equalize the hydrostatic pressure above and below the packer while going in, pulling loose, and coming out of the hole.

This eliminates the necessity of lifting the full column of fluid when releasing the packer from its expanded and set position. The purpose of the testing valve is to provide a means of preventing the drilling mud from entering the drill pipe while going in or out. It also permits formation fluids to enter the empty drill pipe and traps them in the drill pipe after the testing interval.

Mechanical C.I.P. (closed-in pressure) valve . . . This is operated by rotation of the drill pipe thereby acting to positively close at the conclusion of the flow period without pulling the packer loose; thus the formation is allowed to produce into a closed system so that a closed-in pressure buildup curve is obtained.

Pressure recorders . . . These are run on all drill-stem testing strings. It is common practice to run two pressure gages, one being located above the packer as an inside gage. This obtains its pressures from inside the testing string recording all flow pressures, shut-in pressures and hydrostatic pressures. It is also common practice to run another gage located on the bottom of the tail pipe below the packer acting as an outside pressure gage.

This recorder is blanked off and obtains its pressure from the annulus. The running of two pressure recording devices in this manner supplies a positive check on the mechanical success of the test and will indicate immediately any defects such as plugged perforations or plugged chokes, etc. These pressures are very essential for exact interpretation and formation evaluation. Special Amerada type gages are available to the industry which provide a high degree of accuracy in obtaining these pressures.

Packers . . . These consist of a packer element made up of a rubber composition mounted on a sleeve-type device consisting of a telescoping mechanism. They are expanded by partial weight of the drill pipe, thereby shutting off and isolating the formation to be tested. Packer sizes are selected depending on the size of the hole to be tested; the usual practice being from ¾ to 1½ in. below the diameter of the hole. For example: 5½-in. rubbers are used in 6⅛-

Capital for Oil Companies

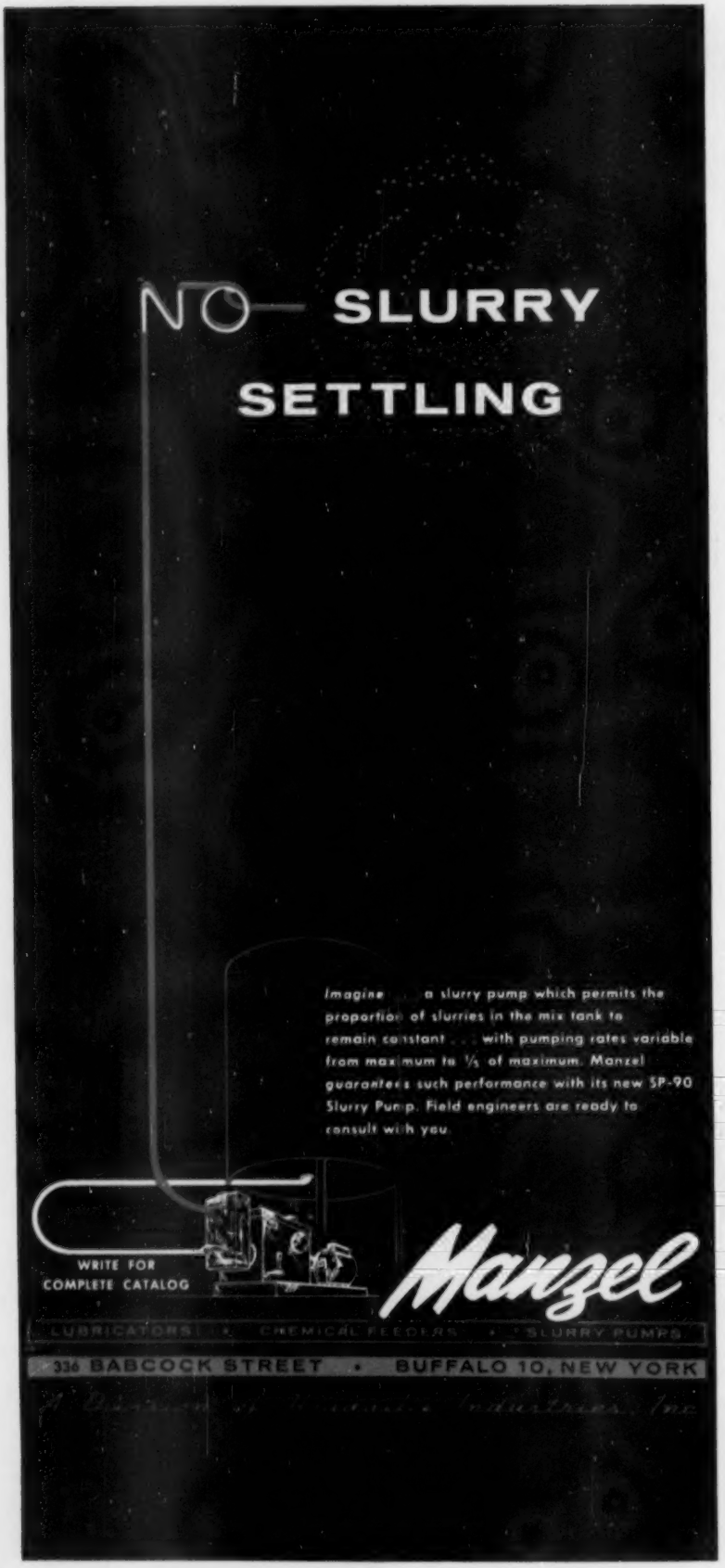
The facilities of our organization are available to executives of Canadian and American companies engaged in all phases of the oil and gas industry—exploration, development, pipeline and refining.

Inquiries are invited by our Underwriting Department at our Head Office in Toronto or at any of our Branch Offices across Canada.

Members of
The Investment Dealers' Association of Canada
Toronto Stock Exchange
Montreal Stock Exchange *Winnipeg Stock Exchange*
Canadian Stock Exchange *Vancouver Stock Exchange*

Affiliate
Gairdner & Company Inc.
60 Wall Street, New York

Gairdner & Company Limited
320 Bay Street, Toronto, Canada
Montreal Kingston Quebec Calgary Vancouver
Hamilton Kitchener London Edmonton Winnipeg
New York


NO— SLURRY
SETTLING
Imagine . . . a slurry pump which permits the proportion of slurries in the mix tank to remain constant . . . with pumping rates variable from maximum to 1/5 of maximum. Manzel guarantees such performance with its new SP-90 Slurry Pump. Field engineers are ready to consult with you.
WRITE FOR COMPLETE CATALOG
Manzel
LUBRICATORS • CHEMICAL FEEDERS • SLURRY PUMPS
336 BABCOCK STREET • BUFFALO 10, NEW YORK

in. hole or 7½-in. rubbers in 9 or 8¾-in. hole.

Hook wall-packer assemblies are used when testing in casing. The packer element is mounted on a telescoping mandrel which is supported by slips which can be manipulated in such a manner as to support the weight of the drill pipe or tubing, when the packers are expanded and seated.

Auxiliary Equipment

Pumpout sub or circulating valve . . . This is a safety device which permits oil and water recoveries to be pumped out of the drill pipe by reverse circulation into a flare pit at the surface. It also can be used to kill a well should swabbing take place while removing a testing string from the hole. Its use minimizes the fire hazard while pulling a wet string containing live oil and gas.

Subsurface choke . . . The purpose of this device is to control the flow of fluids from the formation, providing better control of the well when high pressures are encountered. It also aids in obtaining data which may be valuable to the subsequent well completion. Hydraulic subsurface adjustable chokes are also available to effect a slow opening of the testing valve thereby decreasing shock loading of the formation.

Hydraulic or mechanical jars . . . Their main purpose is to provide a jarring action to aid in removing the testing string from the hole in case of stuck anchor or packer. Jars are run on 85 to 90 per cent of all drill-stem testing jobs performed in Canada.

Safety joint or break-off sub . . . This is a means of releasing the testing tools from stuck anchor or packers. They are usually disengaged by rotation of the drill pipe.

Disk sub . . . This consists of a steel body with a fluid passage blanked off by an aluminum disk with an O-ring seal to prevent leakage. A bar is dropped inside the drill pipe to rupture the disk. This is run on specialized testing techniques developed to provide extensive bottom-hole pressure information for use in various formulas commonly used for reservoir evaluation. This technique is known as the dual closed-in pressure method.

Side-wall anchor tool . . . This is used for straddle testing; it consists of a set of mechanical slips mounted on a wedge-shaped body together with guide springs and run below a straddle-packer assembly in open hole to provide support for the mechanical weight required to set the packer. This tool eliminates the need of anchor pipe ex-

GIRDLER OFFERS YOU...

proven experience in process plants

Girdler ammonia plants are now under construction in Ontario, Maine and Georgia.

DESIGN: Girdler's research and development department is well equipped to assist with all types of process problems. A technical staff is available for consultation, and Girdler's research group can be employed on special problems at reasonable cost.

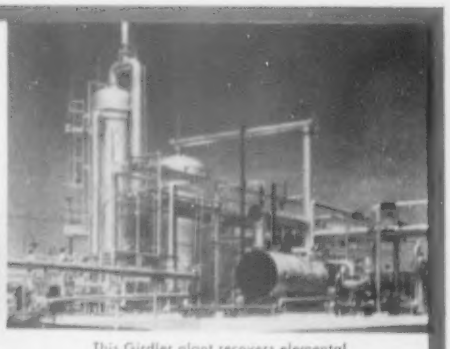
ENGINEERING: Experienced executives direct a group of engineering specialists, trained for every job requirement. In addition to basic process and equipment design, Girdler engineers have broad experience in designing buildings, foundations, electrical systems, boiler plants, instrumentation, etc.

CONSTRUCTION: Girdler engineers supervise and direct all phases of construction for safe, on-time results. When the job is completed, experienced operating engineers will start up the plant, train operating personnel, run acceptance tests and supply complete operating data.

Hydrogen Plants	Nitric Acid Plants
Chemical Processing Plants	Acetylene Plants
Hydrogen Sulfide Plants	Sulphur Plants
Synthesis Gas Plants	Ammonia Plants
Carbon Dioxide Plants	Formaldehyde Plants
Gas Purification Plants	Ammonium Nitrate Plants
Plastics Materials Plants	Fertilizer Plants
Carbon Monoxide Plants	Phosgene Plants

Catalysts & Activated Carbon

This Girdler GIRBOTOL plant purifies both liquid and gaseous hydrocarbons.



This Girdler plant recovers elemental sulphur from hydrogen sulphide.

• Take advantage of Girdler's proven experience when you start to plan your processing facilities.

GIRDLER CORPORATION OF CANADA LIMITED

111 Richmond Street, West—Suite 911

TORONTO, ONTARIO

tending from the packer to the bottom of the hole.

Flush-joint pressure equalizer . . . This is run in conjunction with the side-wall anchor assembly and conventional straddle tests. The purpose being to serve as a bypass to allow fluid to pass through the mandrel of the lower packer while running the string of tools in and out of the hole; thus relieving the anchor below the packer of all the hydrostatic mud weight. It also provides a reliable indication of leakage of either packer during the testing period.

Maximum temperature reading thermometers . . . These are also available to be run on drill-stem tests to provide accurate bottom-hole temperature data.

Example 1

Advantages . . . Advantage of using straddle packer-flush-joint bypass equipment. In a well with total depth of 10,200 ft. a 10-ft. zone is to be tested 195 ft. off bottom (Fig. 5). Mud weight is 9.6 lb. per gallon, drill pipe is 4½-in. A.P.I. full hole, 20 lb. per ft. with tool joints, size of drill hole is 8¾ in. If the formation is to be tested with a single packer, the weight of the drill pipe as shown on the weight indicator with the testing valve closed and packer not set, will be equal to the actual weight minus the buoyancy effect which is equal to 220,000 — 5,000 × 15.9 = 140,900 lb.

The total weight on the anchor is the hydrostatic mud pressure times the area of the drill hole, plus the weight required to set the packer and that is equal to 5,000 × 60.13 + 20,000 = 320,651 lb., assuming that 20,000 lb. of weight was set on the packer.

If the same formation was to be tested with straddle packers using the pressure equalizer and anchor pipe, then the loading on the anchor is 61,000 lb. and the weight on the short spacer between the packers is 316,250 lb.

When the packer is compressed and the testing valve opened, the loading on the spacer is equal to the hydrostatic pressure times the annular area between the drill pipe and well bore plus the buoyancy effect of the hydrostatic pressure times the area of the outside diameter of the drill pipe, minus the buoyancy effect of the hydrostatic pressure times the area of the outside diameter of the pressure equalizer, plus the weight required to compress the packers.

The area of the outside diameter of the pressure equalizer is equal to 0.88 sq. in. The area of the annular space between the drill pipe and well bore is 44.23 sq. in. or the loading is equal to 5,000 × 44.23 + 79,500 — 0.88 × 5,000 + 20,000 = 316,250 lb.

The upward force pushing up on the lower packer is equal to the hydrostatic pressure times the area of the well bore minus the hydrostatic pressure times the area of the anchor wall, minus the hydrostatic pressure times the outside diameter of the pressure equalizer. The area of the anchor wall is 8.2 sq. in., therefore the upward force is equal to 5,000 × 60.13 — 8.2 × 5,000 — 0.88 × 5,000 = 255,250 lb. Therefore, the loading on the anchor pipe below the packer is 316,250 — 255,250 = 61,000 lb. (Fig. 6).

In the case where this interval is tested with the equalizer and the side-wall anchor assembly, the loading on the slips is only the weight required to compress the packer which in this case is 20,000 lb. The weight supported by the perforated spacer is as above or 316,250 lb. The force pushing up over the bottom packer is equal to the area of the bore hole times the hydrostatic pressure, minus the area of the outside diameter of the pressure equalizer times the hydrostatic pressure which is equal to 60.13 × 5,000 — 4,400 = 296,250 lb. The weight supported by the slips is equal to 316,250 — 296,250 = 20,000 lb. (Fig. 7). This illustrates the advantage of using anchorless straddle packers when testing an appreciable distance off bottom.

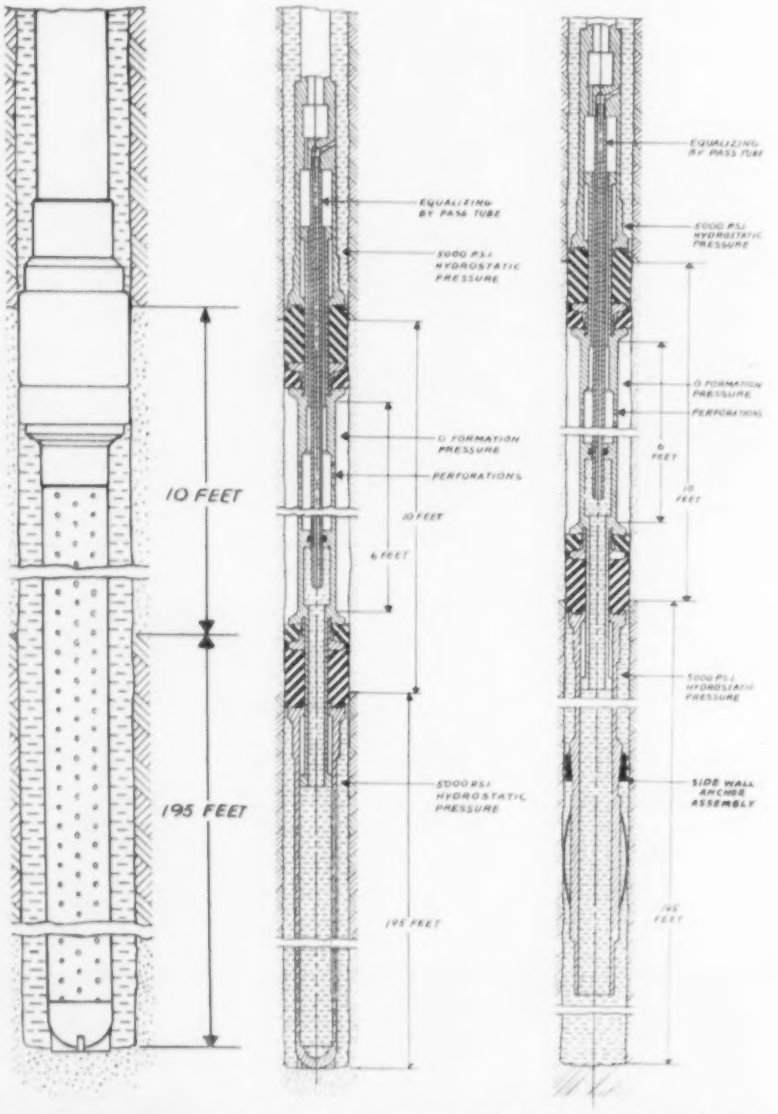
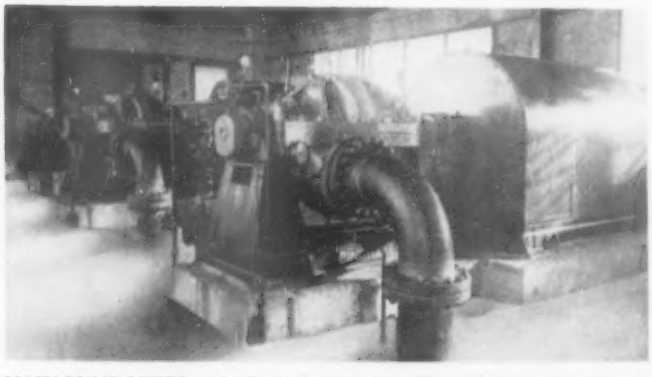


Fig. 5 (Left)—The operator desires to test a zone that is 195 ft. off bottom if a single packer is used, the weight on the anchor will be 320,651 lb. Fig. 6 (Center) If the zone is tested with straddle packers using the pressure equalizer and anchor pipe, the loading on the anchor pipe below the packer is 61,000 lb. Fig. 7 (Right) If the zone is tested with the equalizer and the side-wall assembly, the loading on the slips is only 20,000 lb.

PEMBINA'S MAIN PUMP station at Buck Creek as seen from the air during winter.



MAIN PUMP UNITS at the Buck Creek station. The 1,250-hp. units will soon be augmented with another of equal size.

MUSKEG makes pipeline construction tough during warmer weather. Here a gate valve is installed for tie-in to lateral.

Here's How Pembina Beats the Weather Problem

by F. A. Madill and K. M. McMillan

CANADA—Where Oil Is King

Pembina Pipe Line, Ltd., has grown tremendously in the short 18 months of its operation. In doing so some pipeline problems peculiar to Canada had to be solved. An operating staff had to be trained, bad roads and muskeg contended with, and means devised for handling highly viscous oil in cold temperature.

THE Pembina Pipe Line, Ltd., system has grown from one serving 3 batteries and about 45 wells to one serving 162 batteries and 1,000 wells in a period of 18 months. The operating staff covering gaging, maintenance, and pump station was composed of seven men when the first oil was accepted into the pipeline. This staff has grown to some 85 men at this time.

It must be appreciated that the number of experienced pipeline employes in this region is very limited. Building a trained operating staff has been one of the most serious problems. The company has been fortunate in obtaining a high caliber of field employes and the operating staff is now in a position to handle normal expansion.

Cold-weather problems . . . The first winter of operation was approached with some misgivings regarding the handling qualities of Cardium crude oil. The crude gels at approximately 35° F.; however, agitation such as pumping breaks the gel and it moves freely. This has been found to be true even in surface lines which have remained idle in subzero weather for several days.

Oil which has not been heated presents another problem and one which had not been anticipated. Hydrate crystals and pea ice form in subfreezing weather on the underside of tank roofs. The sun or a rapid temperature change cause these particles to fall into the oil

when they remain in the solid state. There is another impurity present in small quantities in the crude oil—sand from fracturing processes and from the formation. In cold oil, the ice and sand remain suspended and are eventually drawn into the dump suction. The results are primarily stuck valves and plugged suction lines with consequent loss of throughput. Several cases of scored pistons and liners have resulted from the sand.

Where the producer heats oil to as little as 50°, the crystals and ice particles melt, and the sand settles out in the tank bottoms. This insures easier handling of lease crude. Sand is generally only present in new well production.

Main pump station . . . The main pump station at Buck Creek, which pumps into the 16-in. to Edmonton, was completed in January 1956. It consists of the following facilities: two 1,250-hp. and one 600-hp. electric motors coupled to centrifugal pumping units; three 80,000-bbl. oil-storage tanks; pump house and office building; garage and warehouse; water and sewerage system; and six houses for station personnel.

This station is unique in western Canada in that it is completely electrically powered. The pump station has a winter capacity of about 111,500 bbl. per day to the Edmonton terminal, using 2½ pumping units. Deliveries from the station increased to a peak of 111,500 bbl. per day on February 18, 1956. Since then crude demand dropped off temporarily but with the summer demands throughput has started to climb again.

Just prior to the initial startup, the outside air temperature dropped to 35° below zero which resulted in many added problems. Steam condensate lines froze, leaving parts of the station without heat; valve operators refused to function; sump pumps became so stiff the motors would not turn them; microswitches failed to operate in the severe cold.

One by one the problems were overcome — electric welding machines thawed condensate lines; very light lubricants permitted valve operators to work even in more severe cold weather; steam released into sumps warmed the pumps sufficiently to start them working. As these difficulties were cleared up, others appeared. It was found heavy snow or a heavy frost would plug intake air filters on the electric motor ventilating system. The remedy was simple; sweep the snow or frost from the filter. Heaving ground caused service pipes to fracture on boiler fuel lines and heaving also caused the suction and discharge lines on the main pump units to settle.

High water, then fires . . . Spring brought a heavy runoff and as grading had not been completed around the station, some areas became small ponds. Water made its way into conduit manholes, and into motor-ventilating ducts.

Don't let vapor losses (or other thieves) steal you blind.

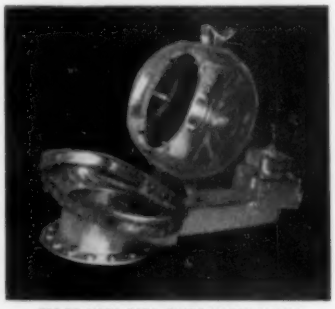
1. Corrosion of tanks. Reduced when correct pressure setting is maintained on all tanks in storage battery, and oxygen is excluded.
2. Gravity drop (premium of 2c per barrel) can be stopped. Many users of vapor control system have reported gravity increases after installation.
3. Volume losses (2½% per degree gravity drop). Very substantial savings have been reported.
4. Lifting costs. These costs can be cut, because with the gravity and volume losses stopped, every barrel produced is saleable.

The elimination of any one of these thieves will more than pay for the installation of an Enardo vapor control system.

The Enardo 770 "By-Pass" thief hatch valve shuts off from the vent line for vapor control. When the hatch is open the "By-Pass" controls the opening into the vent line, sealing off the rest of the tanks in the battery. This automatically holds the correct pressure settings and excludes oxygen. Holding the pressure in all tanks prevents large gravity and volume losses during normal working conditions. The 770 Series hatches feature "bottle-tight" seals and De-icer action gaskets.

Call, write or wire Enardo for additional information.

770 VAPO-GARD THIEF HATCH VALVE



770-BP VAPO-GARD THIEF HATCH VALVE

ENARDO manufacturing company

BOX 1647 TULSA, OKLA

THE AUTHORS

F. A. MADILL

K. M. McMILLAN

F. A. Madill is assistant general manager of Pembina Pipe Line, Ltd. He is a graduate of University of Alberta with a degree in civil engineering. Before joining Pembina Pipe Line he spent 7 years in geophysics work with Imperial Oil, Ltd., and an equal priod with Imperial Pipe Line Co., Ltd.

K. M. McMillan is field operations manager of Pembina Pipe Line. He graduated from University of Alberta with a degree in civil engineering and spent 2 years with Texaco Exploration Department, Pipe Line Division, before joining Pembina.

REFINING PROGRESS IN CANADA

VIEW OF CONSUMERS' COOPERATIVE REFINERIES LIMITED AT REGINA, SASKATCHEWAN. CONSTRUCTION, ALMOST DOUBLING THE CAPACITY OF THIS PLANT, WAS COMPLETED IN 1954.

Refinery Engineering Limited is proud of the refining facilities it has designed, engineered and constructed and looks forward to greater achievements as the demand for refined products expands at an increasingly rapid pace.

We will appreciate the opportunity to discuss with you the revamping or expansion of your present plant or the engineering, design and construction of a new refinery, chemical plant, ore processing, secondary recovery or gas processing facility.

77 York Street, Toronto

TRECo

REFINERY ENGINEERING *Limited*

NEW YORK TORONTO TULSA

GAGERS' PICKUPS are equipped with radio and centrifuge mounted in cab.

It was necessary to maintain crews pumping water from the manholes adjacent to the ducts on an around-the-clock basis. Prior to discovery of water in the ventilating ducts, the leads on one 1,250-hp. electric motor had burned out as a result of saturation from water carried by the ventilating air. These conditions are now under control and the installation of drainage lines around the pump house proper should insure against their recurrence.

Following the spring thaw, there was an extended dry period and the bush which surrounds the station became quite dry. Forest fires in the immediate vicinity presented a hazard and on one occasion fires burned to within 400 ft. of the 80,000-bbl. storage tanks. Pipeline personnel, using lines of fire hose and water trucks, extinguished the blazes adjacent to the station. Rains have now reduced the fire danger and it is unlikely there will be a recurrence this year.

Year-round construction . . . As of June 1, 1956, there were 1,000 producing wells being served by 162 batteries. The gathering network had been expanded to about 229 miles, ranging in size from 3 to 16-in.

Our pipeline construction program is carried on throughout the year with only a brief pause during the spring breakup period which lasts from 4 to 6 weeks. During this period, March 15 through April, warm weather melts the snow and brings the frost out of the ground, turning roads in the area into veritable quagmires. Producing companies are beset with the same problems and drilling comes to a halt.

During the winter season construction equipment can be moved anywhere, including across muskeg, and pipelining goes on with all lines being placed on the surface. No ditching is carried out as frost penetrates the ground to a depth of 5 to 6 ft. Wrapping lines is impossible when temperatures drop to 30° below zero. As a result of the past winter's activity we have almost 80 miles of surface line to coat and bury this summer, in addition to the regular summer construction program. Temporary road crossings and gate plants will be reconstructed on a permanent basis.

With the development of Pembina field northwest into the Cynthia area during the past year, our gathering system has been extended in this direction.

Pump-to-gravity conversions . . . This summer we plan converting one of our 8-in. main gathering lines from a pressure to a gravity system with a booster station located near the south end of the line. This 8-in. main line and laterals will handle the production from an area of about 30 sq. miles. The booster station injecting into an 8-in. line will consist of an electrically powered pump and one 750-bbl. high tank; all controls will be automatic.

"I just happened to think—is the tide in or out?"

CANADA—Where Oil Is King

Many other gathering lines will be converted this year from pressure to gravity operation thus minimizing the number of field pumps required. There has been no particular problem in gravitating Pembina crude in the winter provided that the oil temperature is maintained at 50° F.

The power company serving Pembina field is currently extending its distribution system through the central portion of the field to take care of power requirements at well pumps. We anticipate converting several field battery pumps from internal-combustion engines, using natural gas as a fuel, to drive by electric motors. This conversion program will be undertaken at only those batteries in the heart of the field which are presently handling crude from drilled-out leases.

Automatic custody transfer . . . Considerable experimentation will be carried out in conjunction with the major producers on automatic batteries including meters and on proving tanks for custody transfer of oil. We expect at least two batteries will be set up on an experimental basis this summer.

Pumping and oil-storage facilities at the Buck Creek pump station are to be increased this year. Present plans include the installation of a fourth pumping unit which will be a centrifugal pump powered by a 1,250-hp. electric motor. This unit will provide us with a standby pump, as throughput increases this season.

The maximum throughput using three full units will approach 125,000 bbl. per day at 1,350 psi. summer operation. Winter throughputs out of the pump station will be reduced to approximately 10 per cent due to increased viscosity brought about by low winter temperatures. Oil temperature in the main line drops to a minimum at 34° F. during the months of February and March. Maximum oil temperature of 50° F. in the main line is reached during the month of July.

A fourth 80,000-bbl. oil-storage tank is under construction at the pump station now and will be placed in service within a month; this will afford us a total storage capacity of 320,000 bbl.

Redesign Reduces Bit-Tooth Breakage in Tough Canadian Drilling

Bit design may make a lot of difference in how easily a hole is drilled. Tooth breakage was a serious headache in Pembina before long-tooth bits were redesigned. With the new bits, hole is being made faster not only in Pembina but in many other areas of Canada.

by James E. Sayers

ONE highly significant aspect of Pembina's influence on the Canadian drilling industry is the role it has played in developing improved drilling tools —particularly rock bits. One of the most widely used long-tooth bit types in Canada today was developed primarily because of Pembina.

Most of the Pembina drilling is in sand and shale. The custom is to drill down to the top of the Cardium sand with long-tooth bits and then use a diamond-core bit of smaller diameter to sample the formation.

At first tooth breakage from the long teeth constituted a problem. When the time came to core, several junk-basket runs and expensive, time-consuming magnet runs were necessary to clean out the broken teeth that almost invariably followed the hole. This junk was quite a problem because unless it was completely removed the expensive diamond-core bit would be damaged by the broken teeth.

Breakage problem . . . In the fall of 1954, Security Engineering Division, Dresser Operations, Inc., sent a team of engineers to Pembina to try to whip this tooth-breakage problem. Test bits were run for short periods of an hour or so and then pulled green.

Most of the tooth breakage occurred during the first hour or two. It seemed that while the long teeth were still sharp, their thin tips broke off early; thereafter, the blunt bases of many of the teeth had to accomplish the remainder of the work along with those teeth left unbroken.

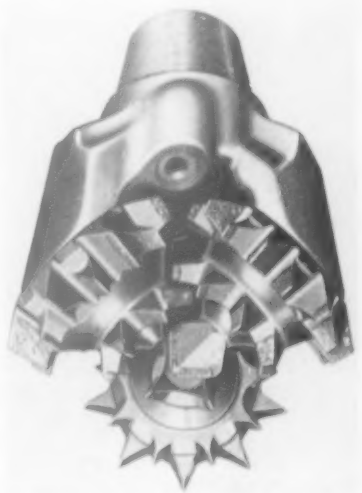
The engineers reasoned that a slightly shorter and wider tooth should have greater tooth life and still dig just as fast. Such a bit was designed with the teeth $\frac{1}{16}$-in. shorter and with a 43° tooth angle as contrasted to the previous slimmer tooth angle of 37°. The tooth pattern was altered slightly and several experimental models were field tested in Pembina. Tooth breakage was reduced to a minimum.

Performance better . . . With the new tooth design bit weight was increased so that penetration rate was higher than that of the earlier slimmer-toothed bits. Best of all, the shorter, wider teeth bore the weight. The bit was put into production and called the S3P, the "P" for Pembina.

In a short time, this sturdier-toothed bit established a reputation for itself. Following exclusive use of the S3P in many holes, magnet runs returned only 4 or 5 ozs. of steel shavings or none at all prior to coring. Before the S3P's development, two or three such runs were necessary to bring out 5 or 6 lb. of broken tooth junk. Use of the S3P, in many cases, has eliminated magnet runs before coring.

As Pembina's development has progressed, the average time from spud to spud has been reduced from around 21 days in 1954 to 14 or 15 days at present. The number of drilling bits run beneath the surface casing has been reduced from an average of 12 down to 8. These wells tap the Cardium sand from 4,600 ft. on the east flank of the field to 5,800 ft. on the west. The average thickness of the net pay sand for the field is 25.4 ft. A very few wells tap the Belly River sands which occur a little higher than the Cardium.

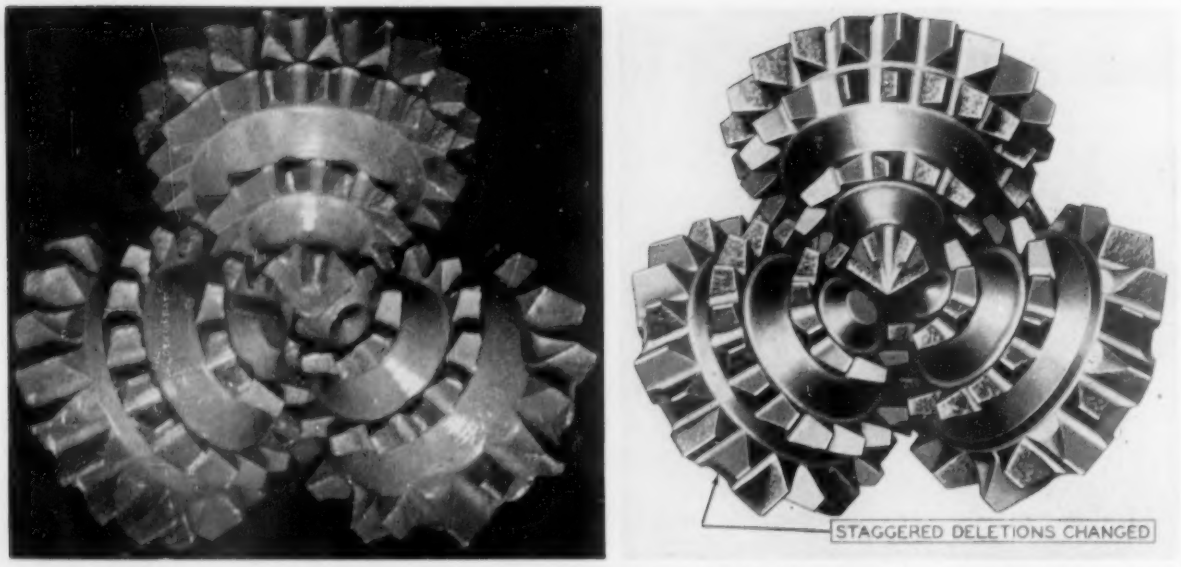
LONG TEETH make this bit desirable for drilling a mixture of sand and shale. Before Pembina, tooth angle was 37°; it is now 42°. Change was to prevent tooth breakage.



THE S3 is Security's newly designed bit with the bigger tooth angle. Both regular bits and jet bits such as this are helping reduce drilling time in Canada.

Alhambra use . . . Wildcatting has been active in areas around Pembina, in an attempt to pick up the Cardium pay. A commercial Cardium field has been discovered in the Alhambra area about 50 miles south of Drayton Valley (headquarters for Pembina).

So far, Alhambra wells are comparable to those in Pembina, with production from the same Cardium Upper Cretaceous formation but occurring from a slightly deeper depth. A re-



MEDIUM HARD-ROCK drilling in Canada requires the bit type at left. It is a modification of the bit at right to improve bit efficiency. Notice that outside alternating tooth deletions appear on two cones of the old bit but on only one cone of the new. Result is full-gage hole all the way.

cent well found the Cardium sand at 5,595 ft. and obtained commercial production from the interval 6,063-72 ft.

In Alhambra, the same sturdy long-tooth bit developed for Pembina has proved to be the most efficient bit. First wells in this area used about half long-tooth bits. Subsequently, long-tooth bits were tried all the way and the drilling time has declined. For example, of two comparable holes drilled with the same rig, the first hole, combining shorter-tooth bits with the long-tooth bits, used 17 bits and took 323 hours to go to 6,100 ft. The next nearby hole used the long-tooth S3P all the way and went to 6,100 ft. in 249 hours using 20 bits. The additional cost of the three extra bits was but a fraction of the money represented by 74 hours saved in drilling time.

By allowing bit weight to increase from a top of 25,000 lb. to a top of 50,000 lb., but with slower rotation, these Pembina-type long-tooth bits drill faster than the shorter, finer-tooth bits formerly employed. This same pattern has followed in other nearby areas, including Bentley and Gilby fields. These latter are extensions of the Joffre Viking Sand field near Red Deer in central Alberta. Depths and formations are comparable to Alhambra and Pembina, though production is obtained from the slightly deeper Viking sand.

Estevan area . . . Over in southeast Saskatchewan, this same Pembina-type long-tooth bit is being used all the way to the producing lime in the booming Estevan area. Estevan had some 100 wells completed by the end of April and at least 500 more are expected to be drilled this year.

The producing Mississippi limes in Estevan are usually found at slightly shallower depths than the Cardium formations in Alhambra and Pembina. At first, Estevan wells were drilled using both long-tooth and shorter, finer-tooth bits. But again it was found that by slowing down the table and adding weight, the long-tooth Pembina-type bits could go all the way to the producing zone faster.

Most of the drilling in the fields described is best accomplished with the Pembina-developed long-tooth bit. In the other areas throughout western Canada, where the same bit is employed for the first few runs under the shoe, it performs with equal success until harder digging is encountered. Up in the Far-North country in the Sturgeon Heights, Dawson Creek, and Fort St. John areas, however, harder digging is encountered higher up.

Much of it is lime requiring a shorter, finter-tooth bit. Here, three or four of the Pembina-type long-tooth bits are run under the surface-pipe shoe and thereafter harder types must be used most of the way. On the average, these wells are deeper. In the Sturgeon Heights reef area, the average depth is around 8,700 to 8,900 ft. Further west and north, depths vary considerably. Holes have been drilled as deep as 12,000 ft. but this is not common.

Efficiency improved . . . Another simple change in bit design was effected recently to increase bit efficiency. A medium hard-rock bit with alternating tooth deletions on the outer edges of the heel teeth on two of three cutters was used extensively in the deeper lime drilling in the north. This bit, though

CANADA—Where Oil Is King

it drilled well enough, did not always make full-gage hole after it had become semidull.

Last year, Security bit designers changed the staggered deletions or notches on the heel teeth of one cutter on the Security M4N type bit from the outer edge of the teeth to the inner side—thus allowing the same tooth clearance but having more gage protection with maximum reaming heel teeth surfaces present against the wall of the hole. Result is full-gage hole all the way. Although such changes appear simple, they have resulted in added bit efficiency.

James E. Sayers, shown here at Mile "0" on the Alaska Highway, is northern regional manager of Security Engineering Division of Dresser Operations, Inc. His headquarters are in Denver, but his duties take him into all parts of Canada.

GOING TO MARKET

...with Canada's first "big inch" gas pipe line

The Westcoast Transmission Company's pipe line, now under construction, will carry Peace River natural gas 650 miles south to Vancouver and the Pacific Northwest. These markets will be served economically because Westcoast is a big diameter pipe line, able to move large quantities of gas over long distances at low costs. Deliveries in 1957 will mark the first distant marketing of Alberta-British Columbia natural gas to heavily populated areas – an important milestone in the development of Canadian natural resources.

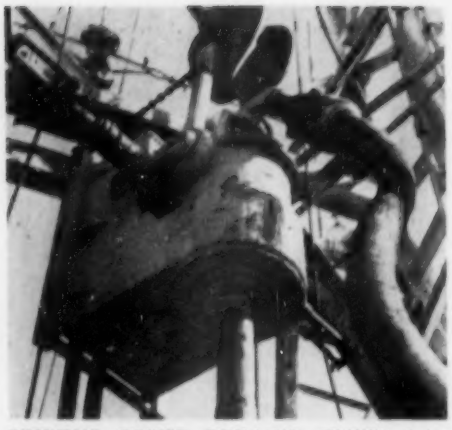
Engineering and construction of the Westcoast Transmission Company's 30-inch pipe line is under Canadian Bechtel management.

Builders for Industry

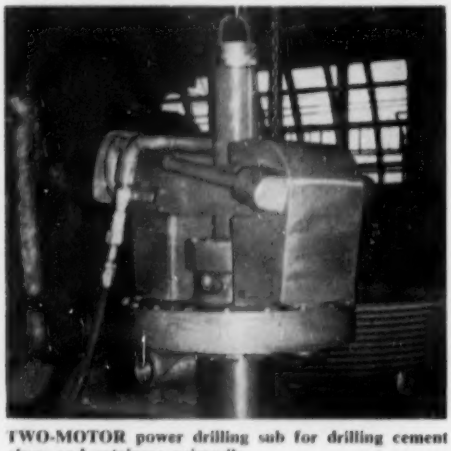
BECHTEL CORPORATION

Los Angeles • SAN FRANCISCO • *New York*

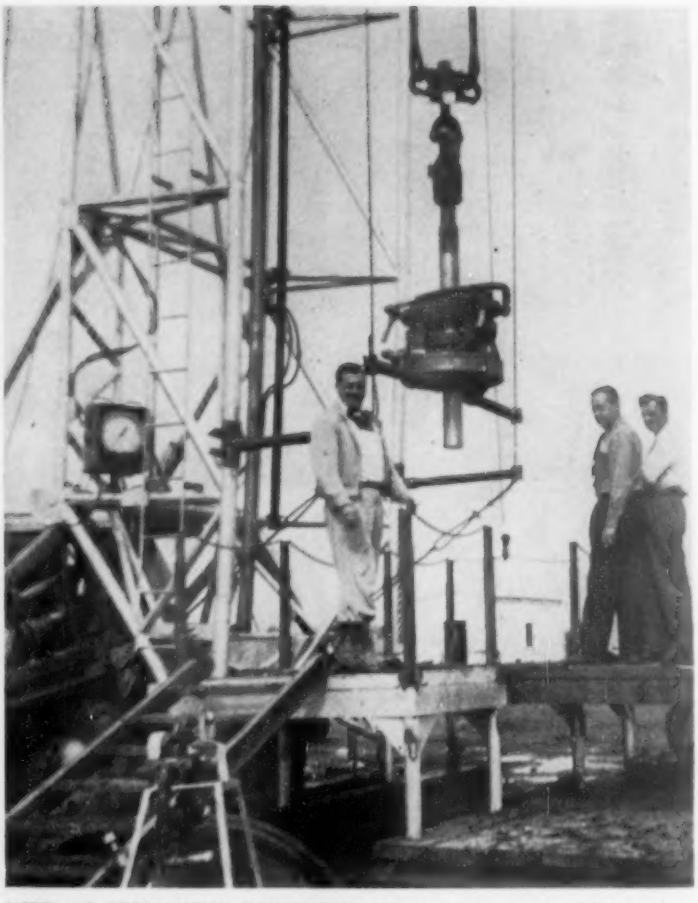
CANADIAN BECHTEL LIMITED • *Toronto* • *Vancouver*



ORIGINAL POWER DRILLING SWIVEL being tested on its original run in April 1955 near Calgary.



TWO-MOTOR power drilling sub for drilling cement plugs and retainers primarily.



USED AS PERMANENT EQUIPMENT, this two-motor power drilling sub is installed on a service rig in Alberta. Torque lines are on the mast.

Power Drilling Sub Whips

by E. M. Blanchard

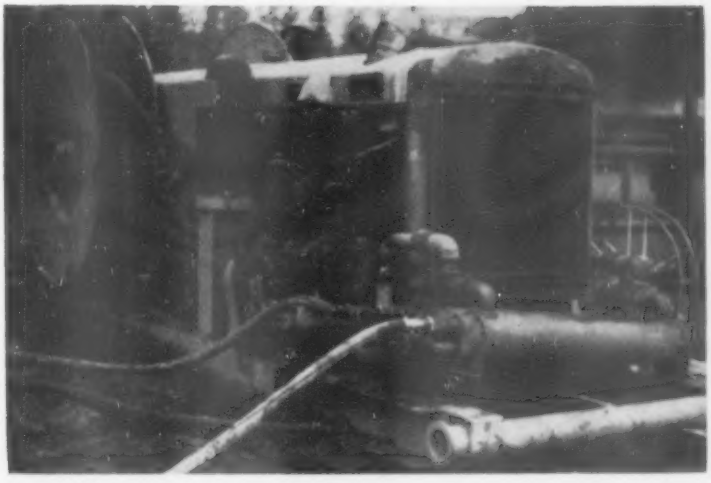
This tool serves to rotate the drilling string where either a rotary table is not available or where the use of the table and kelly is not desired. Use of the kelly is avoided in Pembina coring so that joints can be made without lifting bit from bottom.

ROTATION of the drilling string by hydraulic power equipment hung from the hook has speeded drilling and cut costs in a number of different applications recently. This type of equipment has been extremely useful on service rigs for workover operations, and it has also bested the rotary table in use on regular drilling rigs as follows:

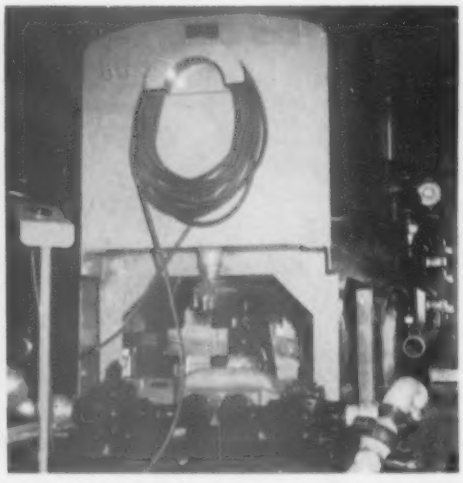
- With a hydraulic power drilling sub providing rotating power from the hook rather than the rig floor, the necessity for picking up the drill string to add a joint of pipe is eliminated. This has allowed 80-ft. cores to be cut without damage to the core bit from iron settled out during joint makeup. It also eliminated the need for magnet and junk-basket runs to clean the hole of iron.
- Since the power sub eliminates the kelly it will allow use of several drill collars for drilling surface hole. This has speeded greatly the spudding of a hole in surface chert where high bit weight is desired from the beginning.
- Hung from the hook, the hydraulic rotary equipment allows complete flexibility of the drill string at the point of power application. This has been helpful in offshore drilling from floating barges where wave action would put a serious strain on a drilling string held fast in a rotary table.

Need for change . . . For some time a need has been recognized among service-rig operators for the provision of compact and efficient equipment to rotate the drilling string when required on workover jobs for such functions as drilling of cement plugs and retainers.

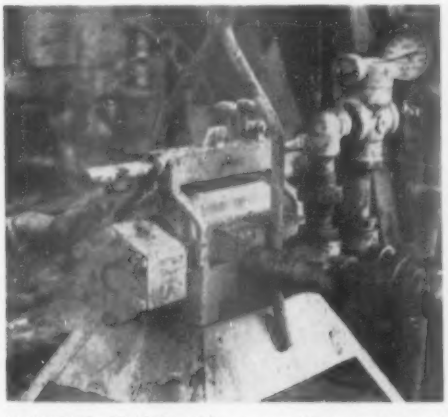
CANADA—Where Oil Is King



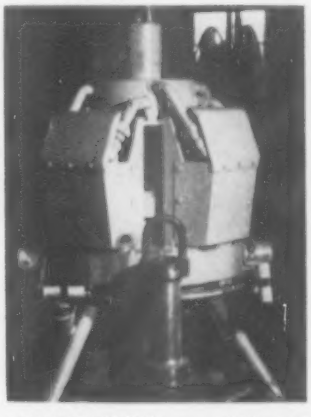
SKID-MOUNTED diesel-powered hydraulic pump. The two large reels at back are for easy transportation. Tubular heat exchangers remove excess heat.



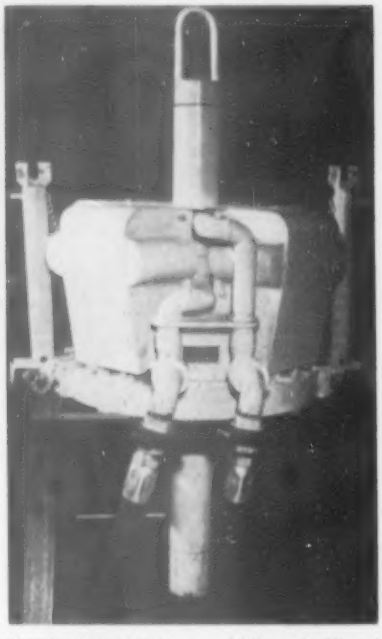
CALIFORNIA MODEL of diesel and hydraulic pump unit.



CONTROL STAND with pressure bypass valve and hydraulic fluid pressure gage which permit adjustment of maximum torque on the string.



FOUR-MOTORED power drilling sub that is skid-mounted for easy transporting. Skid has carrying brackets.



FOUR-MOTORED power drilling sub. Hinged torque arms are placed in the up position for compactness in transportation.

Diamond-Coring Problems

cutting pipe, etc. To eliminate the cumbersome substructure, rotary table, kelly, and kelly bushings, this problem was first met by several manufacturers of oil tools in the United States by the development of the power swivel.

Two years ago the Alberta Oil Tool Co., of Edmonton, Alta., designed and manufactured a power swivel to meet the need for rotating a drilling string at increased speeds and torques required to perform this type of work efficiently. This first power swivel, which it constructed, was rated at 50-ton capacity with speeds up to 85 r.p.m. at a maximum torque of 2,000 ft.-lb.

Shortly after this first power swivel was placed in use in Alberta, Mobil Oil of Canada approached the manufacturer with a special problem which had developed in the Pembina oil field. This problem was creating an exorbitant cost for diamond coring the producing section. The type of formation in that area is such that in order to produce a rapid rate of penetration of rock bits a relatively long-tooth bit is required. The formation is sufficiently hard to create a considerable amount of tooth breakage.

Pembina coring . . . The well program at Pembina consists of drilling 9-in. hole to the top of the Cardium sand and, in the case of Mobil Oil, of diamond coring the producing zone in entirety with a 7¾-in. diamond bit. Even though junk baskets and fishing magnets were run upon completion of the 9-in. hole to remove broken bit teeth and other small iron a large amount of damage was caused by destruction of diamond core heads running on small iron remaining in the hole.

No difficulty was encountered in circulating this small iron away from the core head when coring was started. But as soon as the first connection was made, small junk fell to the bottom of the 7¾-in. rathole. From this point on it was virtually impossible to circulate this iron away from the diamond bit due to the sizable restriction in annular area. Since the Cardium cores varied between 60 and 75 ft. in length some way had to be found to take an uninterrupted core.

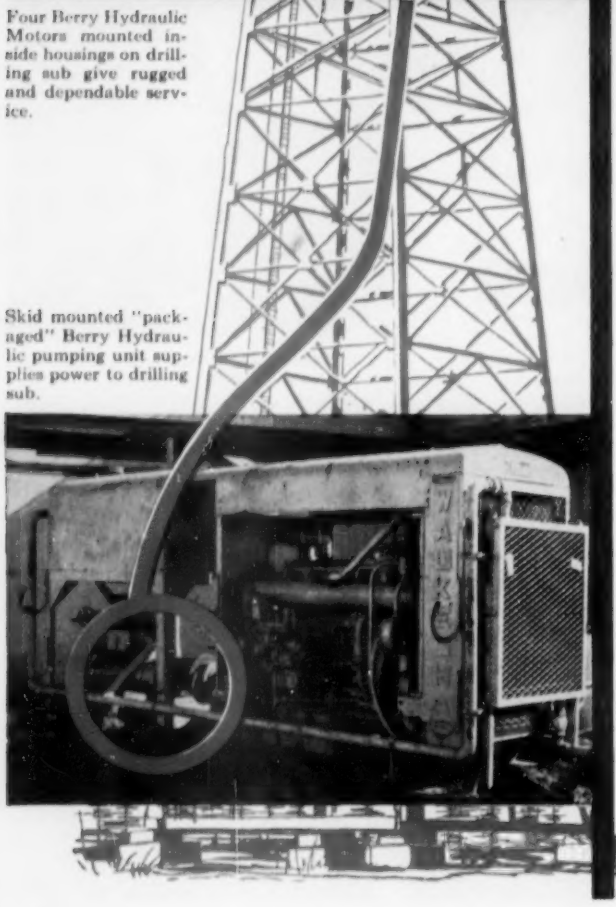
Early in 1955 Mobil Oil of Canada fostered a program whereby a power swivel was built by Alberta Oil Tool of sufficient size and power to turn the

BERRY®

HYDRAULIC UNITS

power new drilling sub

Four Berry Hydraulic Motors mounted inside housings on drilling sub give rugged and dependable service.



Skid mounted "packaged" Berry Hydraulic pumping unit supplies power to drilling sub.

Revolutionary drilling method uses Berry units because:

- Reliability proved in oil field service
- Maximum torque output at stall conditions
- Infinitely variable speed over entire drilling range
- Smooth operation at low coring speeds

The revolutionary drilling sub developed in the Pembina Field uses Berry Hydraulic Motors and Pumps for their on-the-job ruggedness and better performance characteristics.

Berry Hydraulic Motors develop the high torque required in this operation. Mounted around a ring gear, four Berry Motors directly drive the drill pipe at infinitely variable speeds from 0 to 135 rpm. The Berry-powered sub eliminates rotary tables, Kelly joints and rat holes . . . and makes possible continuous coring with 100% recovery, because the bit never leaves the cutting surface. At Pembina, diamond core bit cost was reduced an average of 37.5% with the new drilling sub.

Power oil for the sub is supplied by "packaged" Berry Hydraulic Pumping Units.

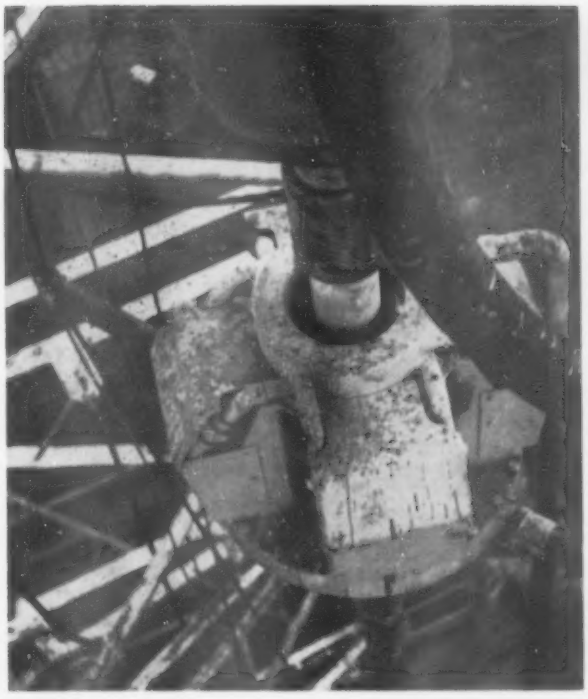
Advantages gained

- Rotary tables and kelly joints eliminated
- Complete core recovery without removing bit from bottom
- No expensive rat holes are needed
- Continuous coring is possible
- Coring costs reduced 26%

Want the full story on Berry hydraulic units?

Write for descriptive literature and catalog showing complete specifications on Berry Motors and Pumps for oil country use.

BERRY DIVISION
OLIVER IRON AND STEEL CORPORATION
PITTSBURGH 19, PA., U. S. A. BC-1



ROTATION OF THE SUB is prevented by the two torque lines attached by yokes at the ends of the arms extending from sub body. Here the kelly is left on to speed rigging up of sub.

CANADA—Where Oil Is King

drilling string during coring in the Cardium section with 4½-in. drill pipe. The original tests for mechanical operation of this large power drilling swivel were conducted by Mobil Oil on one of their company-owned rigs while drilling a 9,000-ft. test near Calgary. The first test of the unit consisted of drilling a short section of 9-in. hole with a rock bit carrying 40,000 lb. of weight at 8,200 ft.

The second test was to diamond core a 50-ft. section at 8,600 ft. with a 6¼-in. bit. After these two tests had been completed the operators were satisfied with the mechanical operation of the unit and decided to put it to use for diamond coring on their contract rigs in Pembina.

Sub developed . . . Field experience with the original service-rig-model power drilling swivel and the larger model developed for diamond coring on drilling rigs indicated the desirability of a radical change in design of the unit to produce better balance and compactness of the equipment and a reduction in the cost of manufacture. This design change consisted principally of: (1) removing the hydraulic driving motors completely from the swivel proper; and (2) building a power drilling sub which could be connected to any conventional swivel.

The resultant power drilling sub operates as a tool which is screwed to the rig swivel and then connected to the drill pipe. It is powered with hydraulic motors which will develop a maximum torque on the drilling string of 4,500 ft.-lb. at speeds up to 135 r.p.m.

To prevent rotation of the power drilling sub, torque arms are extended to either side of the unit when mounted in the rig. These arms are connected by a sliding yoke into a length of sand line extending vertically from the derrick floor. This cable is strung from the substructure on one side of the rotary table to the fourble board, out of the way of the blocks and returning to the derrick floor to be fastened to the substructure on the opposite side of the table. This line is then tightened sufficiently to take the torque developed from the rotation of the drilling string.

Operation of sub . . . Motive power for the sub is provided by a diesel engine of 135 maximum hp. which drives a Berry 32-10-E3 hydraulic pump. The pump has a capacity of approximately 150 gal. per minute with pressures up to 1,500 psi. Engine and pump are skid-mounted together with necessary hydraulic fluid reservoir, heat exchanger, and hose reels to carry the necessary amount of 2-in. high-pressure hydraulic hose to make connections to the component parts of the power drilling sub at the rig. The skidded unit is placed on the ground below the derrick floor.

Hydraulic fluid under pressure travels through the 2-in. hose to a control stand on the drilling floor. Controls consist of a four-way metering valve and a bypass valve system. This provides a control for rotation speed, maximum torque, and reversal of the power sub. From the control stand the fluid continues through connecting hoses to the power drilling sub which is supported by the traveling block and provides the necessary power to turn the drilling string. Return lines from the sub to the control stand and thence to the power unit are also provided.

THE AUTHOR

E. M. Blanchard is president of Alberta Oil Tool Co., Edmonton, which he organized in 1950. He has also served as chief engineer of the company. From 1947 to 1950 he was sales engineer for Lane-Wells Co. in the San Joaquin Valley. During World War II, Blanchard served in the U. S. Air Force and from 1942-47 he was employed by Thomas P. Pike Drilling Co., of Los Angeles, in drilling operations. Blanchard received a degree in civil engineering from Yale University in 1933.

CORING in the Pembina field showed the advantage of rotating the pipe with a flexible power source. Here the sub turns the pipe from high in the derrick. When one joint is drilled down another is added without the bit being raised from bottom as is required with rotary table and kelly. This model uses four hydraulic motors to turn the pipe and is separate from the swivel.

CANADA—Where Oil Is King

The large model power drilling sub proper consists of a rotary sub 6-in. in diameter and 4 ft. long with a left-hand threaded connection on top and a right-hand connection on bottom to which a gear is keyed. The four hydraulic driving motors are Berry model 14-15-A2 which drive the sub through spur or helical gears. These motors are mounted around the outside of the spindle to provide an evenly balanced unit.

Coring operation . . . When the 80-ft. diamond core barrel has been run to bottom, and the power drilling sub is rigged up and connected, the following procedure is used: With core head off bottom, the mud pumps are operated for a period of 8 to 10 minutes at pressures of from 800 to 1,000 psi. to provide the large volume of fluid necessary to pump any small iron up the hole and well away from the core head. The core head is then immediately placed on bottom and rotation commences. When the diamond bit has dug to a point where the sub has followed it down nearly to the derrick floor, the slips are set in the rotary table with the bit on bottom and an additional joint of drill pipe is added to the string by means of a mousehole connection. These connections can be made rapidly enough to prevent any possibility of the return of iron particles to bottom which would endanger the core head.

Field experience on the completion of over 100 wells in the Pembina area with this tool has proved so satisfactory that where it is used, the necessity for junk basket and magnet runs, before running the core barrel, has been eliminated. Since the power drilling sub has been in operation in Pembina, not one diamond core head has been marked or injured in any way by small iron in any well where this unit has been used.

The following illustrates how the use of the power drilling sub has reduced coring costs in Pembina:

Item—	Power drilling sub	Conventional method
1. Supervision per day	$40	$40
2. Rental of magnet per day		100
3. Cost of magnet runs (Approx. 2)		300
4. Cost of bit wear per ft.	5	8
5. Rental of power sub per job	350	
6. Average cost per ft.	28	38

Outcrop spudding . . . Since the power drilling sub's original development as a tool to improve diamond coring practices in Pembina and its use as a rotating tool on service rigs several additional uses and applications have been found for it. Union Oil of California while operating in the foothills of Alberta encountered an extremely difficult problem in spudding a well in the Panther River area west of Olds at a surface elevation of 5,700 ft. A chert formation was found at the surface location sufficiently hard to necessitate blasting to dig the cellar.

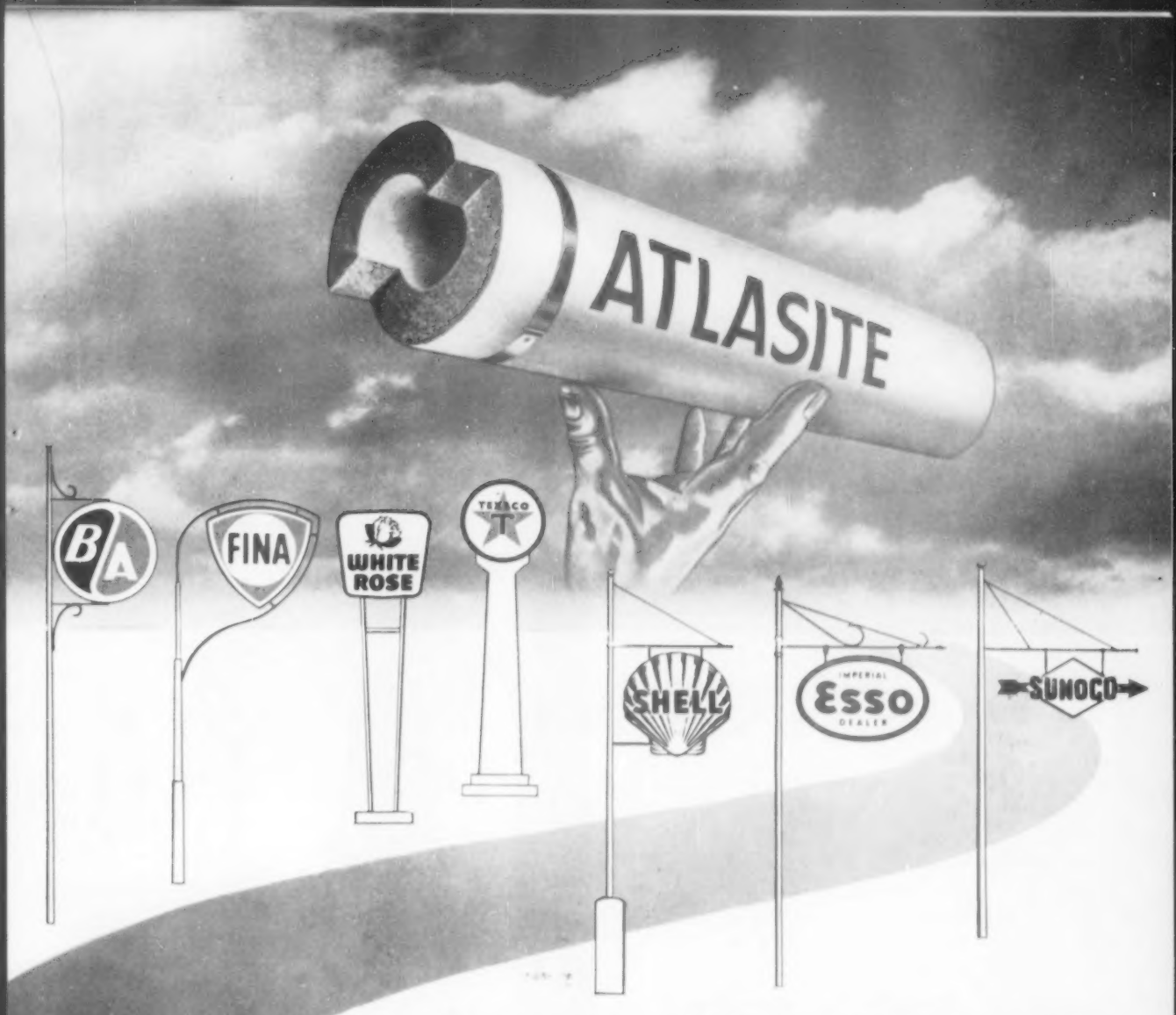
To be able to drill the top portion of the surface hole at a reasonable rate of speed the power drilling sub was used for the top 100 ft. of drilling. This procedure in place of a kelly permitted the use of two large drill collars from the start in order to provide the necessary weight on bit. The operators were entirely satisfied with the operation of the unit on this job and are convinced that considerable time was saved in drilling the top of the surface hole by this method. The method recommended in the case of extremely hard surface formations is to drill the rathole, mousehole, and 100 to 150 ft. of surface hole with the power drilling sub. After this it is then possible to return to conventional methods of rotation.

Further tests . . . Since the successful development of the power drilling sub for the specialized uses in Canada's oil fields, considerable interest has been shown in this unit by operators in other areas. A service-rig model and a drilling-rig model power drilling sub have been built essentially to the same design in California by the Ventura Tool Co. In addition to the uses of this unit, which have already been field tested in Canada, additional applications of this tool are being planned.

The Cardwell Manufacturing Co. is incorporating a power drilling sub in a test to be conducted this summer at Wichita, Kans., wherein a Cardwell rig will be equipped with all modern tools and devices for the most efficient drilling of slim-hole wells. Also this unit is being actively considered to meet the problem of drilling from floating barges for California's offshore program. With anchored drilling barges in deep water where it is impractical to rest the rig on bottom, wave action presents a serious problem when a kelly and rotary table are used.

There are many changes necessary to other drilling-rig components such as tongs, mast, etc., before the principle of rotating the drilling string from the hook, instead of from the derrick floor, can be considered feasible to be efficiently used as a standard method of drilling oil wells. However, many operators believe that the advantages to be gained by this method of rotation may cause the changes necessary to provide a much wider use of this method in the future.

"Hydraulic fluid under pressure travels through the 2-in. hose to a control stand on the drilling floor . . . This provides a control for rotation speed, maximum torque, and reversal of the power sub. From the control stand the fluid continues through connecting hoses to the power drilling sub which is supported by the traveling block and provides the necessary power to turn the string."



ATLASITE IS WIDELY USED IN THE LARGEST OIL REFINERIES IN CANADA

ATLASITE is a rugged insulation with a temperature limit that is conservatively placed at 850° F. It can be easily removed and re-applied without damage. Basically it is Amosite fibre which is peculiarly well suited to give maximum insulation. Atlasite is also widely used throughout Canadian Industrial Plants. Pipe, block and sheet forms in standard sizes and thicknesses and to order in any special sizes required.

Atlasite is a worthy companion to Newall's 85% Magnesia and Newall's Newtempheit.

Atlas Asbestos is the only plant in Canada manufacturing a complete line of pipe and block insulation materials ranging from low to high temperatures.

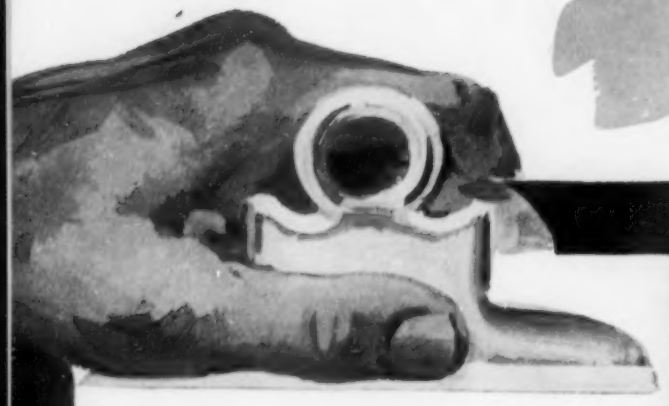
ATLAS ASBESTOS Company Limited

A Member of the Turner & Newall Organization

MONTREAL • TORONTO • WINNIPEG • EDMONTON • VANCOUVER

56-1

TOOLS + ...



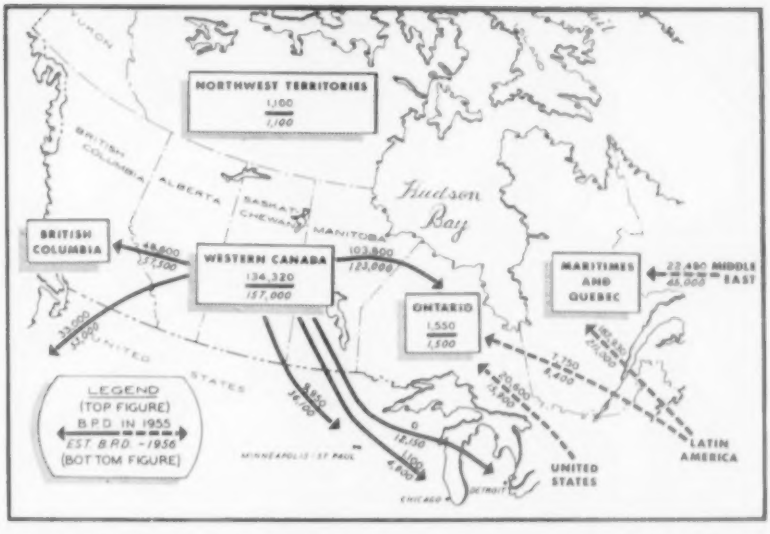
- **Complete Log** of casing run and cementing time for your permanent records
- **Mud Log** during entire casing and cementing operations
- **Cement Log** for proper weight and quality during entire cementing operation
- **Recommendations** for scratcher and centralizer pattern, casing running speed and frequency and length of reciprocation
- **Installation** of all scratchers and centralizers
- **Supervision** of casing and cementing operation by an experienced field service man

...a turn-key job at no extra cost

This means . . . quality controlled tools . . . engineered casing job . . . qualified* field service men . . . backed by complete research facilities and experience gained from handling thousands of casing jobs . . . all of this at no extra cost.

WEATHERFORD *Oil Tool Co.*

*Weatherford men receive continuous technical training on an organized basis to guarantee you the best qualified man in the field to handle your casing job.



CRUDE MOVEMENTS in Canada. Imports are shown as dashed lines. Exports and crude for internal consumption are shown as solid lines. Figures above the lines are in barrels per day for 1955; those below the lines are estimated barrels per day for 1956. For detailed information, see Table 2.

Canadian Refineries Pass U. S. Catalytic Processing Percentage

by George Weber
Refining Editor

CANADA is rapidly closing the gap on the United States in its application of modern processing techniques. Within the next 6 months, the refining industry north of the border will stand in a preeminent position on catalytic processing for high-quality-product output.

This accomplishment in adapting new efficient processes all along the line was realized together with a major construction program required by an average 15 per cent annual increase in product demand. The dual effort gives Canada a top position for making high-octane motor fuels and other quality fuel products. It may surprise many U. S. refiners who have assumed that the industry in this country has remained one jump ahead of the world in that respect.

By the first of this year, Canadian refiners had already passed the U.S. industry in catalytic cracking and polymerization capacity with relation to crude capacity. By January 1957, they will also surpass U. S. capacity in catalytic reforming and hydrogen treating on the same crude basis.

Sparked by a combination of burgeoning demand for petroleum products and a rapid development of domestic crude production, Canada has doubled refining capacity since 1951. Projected crude capacity to next January represents a three-fold increase since the close of World War II.

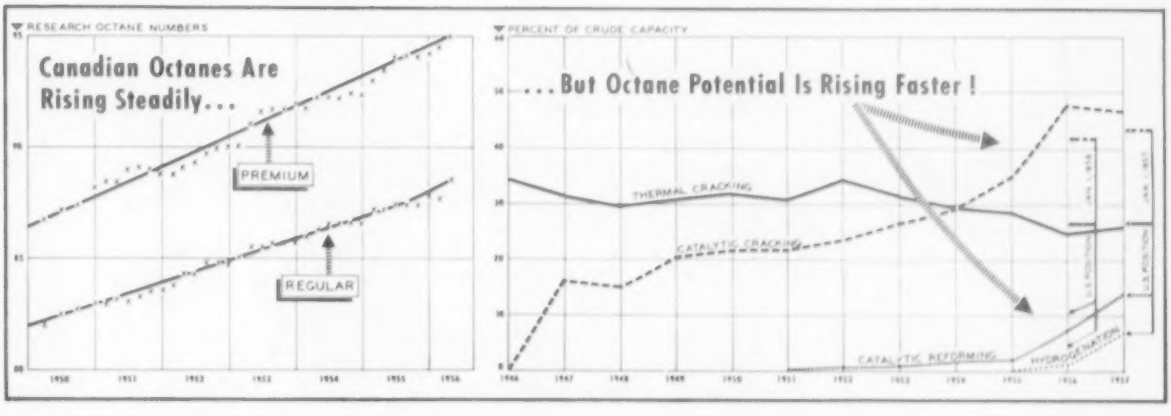
CANADA—Where Oil Is King

Major effort . . . This major construction effort has given the Canadian refining industry a predominant percentage of modern, highly efficient capacity. New refineries have been built from the ground up, and older plants have literally been rebuilt from coast to coast.

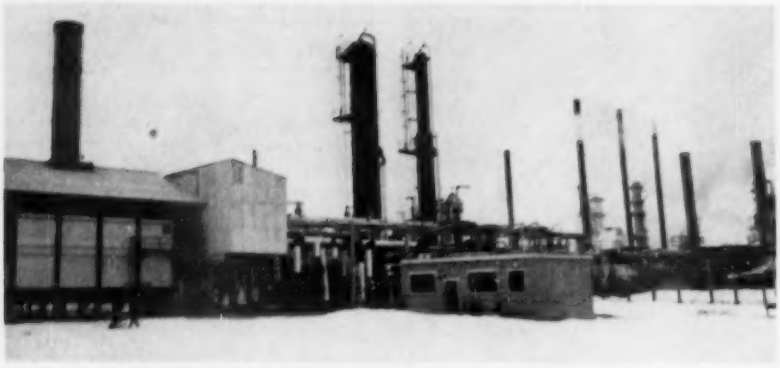
Table 1 shows the present status of processing in Canada and the U. S. Crude capacity is due to increase over 10 per cent this year in Canada vs. a 5 per cent boost in the U.S. The two major countries stand about the same of thermal cracking, which is gradually declining in use, in favor of the superior catalytic processes.

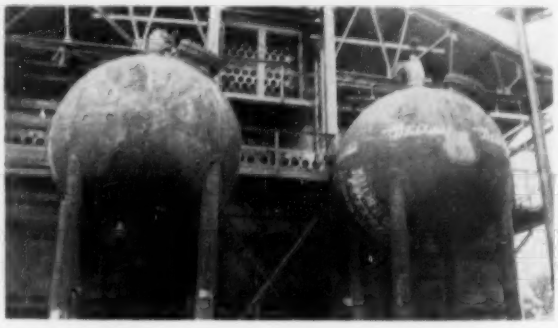
On catalytic cracking, Canada moved sharply into the lead last year. Despite the addition of more crude capacity this year, it will remain in the lead, with 46.4 per cent of crude capacity represented by this type of process, compared with 43.0 per cent in the U.S.

This was the year for Canadian refiners to spurt on catalytic reforming. This process, aimed specifically at motor-fuel octanes, was slow to be adopted in Canada, but as octanes moved upward, refiners have responded quickly. Catalytic reforming capacity will reach 14.0 per cent of crude by the end of 1956, just edging out the U.S. position



CANADA—Where Oil Is King





MANY CANADIAN REFINERIES incorporate new design into their modern process units. This Catforming unit, built by the Lummus Co. of Canada, Ltd., at British American's Montreal refinery, combines heater and reactors in one structure. This is shown at left in top picture. The spherical reactors (shown at right during construction) are housed next to the combination furnace to reduce capital costs in piping and heat losses. This is typical of the many ideas that may be incorporated to increase processing efficiency, insure easier operation, and reduce costs.

TABLE I—CANADA'S POSITION ON PROCESSING CAPACITY

	Canada				U. S.			
	Jan. 1, 1956		Est. Jan. 1, 1957		Jan. 1, 1956		Est. Jan. 1, 1957	
	Capacity (B/SD)	% Crude	Capacity (B/SD)	% Crude	Capacity (B/SD)	% Crude	Capacity (B/SD)	% Crude
Crude	680,645		750,770		8,958,175		9,390,985	
Thermal cracking	167,970	24.7	190,295	25.4	2,355,318	26.3	2,486,699	26.5
Cat. cracking	324,550	47.6	348,050	46.4	3,709,332	41.4	4,031,317	43.0
Cat. reforming	48,800	7.2	104,675	14.0	926,469	10.4	1,281,154	13.7
Hydrogenation	7,397	1.1	53,272	7.1	433,005	4.8	633,605	6.7
Alkylation	2,259	0.3	2,259	0.3	263,409	2.9	278,109	3.0
Polymerization	17,805	2.6	22,525	3.0	141,650	1.6	142,265	1.5
Lubes	8,210	1.2	8,210	1.1	186,151	2.1	188,751	2.0

which will stand at an estimated 13.7 per cent.

Also a slow starter in hydrogen treating, the Canadian refining industry is moving fast and will pass the U.S. this year in relative capacity of this type. Canadians have used more polymer in their gasoline than U.S. refiners for some time, and their capacity is still rising gradually.

The one high-octane-gasoline component that Canadians now lack is alkylate. There are only two units in that country at this time, and the nation lags the U.S. in percentage of capacity. This is due mainly to the impetus of the heavy aviation-gasoline demand which U.S. refiners have enjoyed for the past 10 years. However, alkylate is now becoming an ever-increasing component in motor fuels and as Canada's octane requirements continue to rise, more alkylation facilities will be added there.

Octanes moving up fast . . . With this new potential for making higher octane motor fuel, the Canadian industry finds itself in possession of a comfortable cushion on motor-fuel quality. The trend in weighted average research octane number of Canadian gasoline, shown in the accompanying chart, plots values which have been made available publicly for the first time this year, by Ethyl Corp. This octane history over the past 6 years shows a steady gain of about 1.3 research octane numbers per year for premium grade and just over 1 research octane number for regular.

But the samples taken from nine Canadian cities this year indicate that the octane pace is beginning to grow swifter. This reflects the ability to produce fuels comparable to the 97-octane premium and 90-octane regular averages recently reached in the U.S. It results from a horsepower and compression ratio race which closely matches that of the American automotive industry. If these present trends continue as indicated, Canadian motorists will rapidly close the approximate two-octane number gap by which they lag the U.S. in both premium and regular-grade gasolines.

Self-sufficiency coming . . . In order to meet the staggering 15 per cent annual boost in demand, Canadian refiners still depend heavily on imported crudes. The development of domestic production in the western provinces has long since erased the costly crude imports moved by rail from the U.S. to refineries in Alberta, Saskatchewan, and Manitoba. Last year, the British Columbian industry converted completely to Alberta crude, and the extension of the Interprovincial Pipe Line to Sarnia displaced most of the crude imported to Ontario refineries.

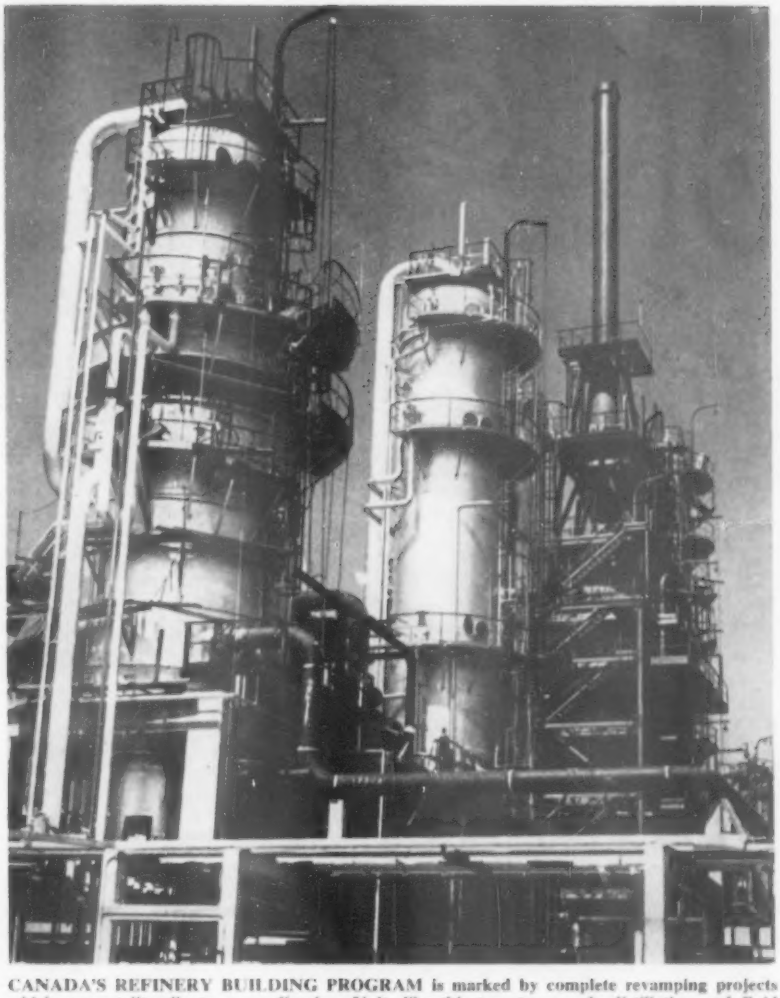
See Table 2 and the accompanying map for breakdowns on sources of Canadian crude.

Some imports from the U.S. and Latin America continue into Ontario under long-term contracts, but it is expected that this flow will dwindle further next year, when western crude will be delivered by pipe line to the outskirts of Toronto.

The advent of domestic crude in the major Montreal East refining center is still questionable. It is probable that

Over the next 25 years, Canadian oil requirements are expected to treble. Various estimates by industry leaders place annual consumption at 625,000,000 to 730,000,000 bbl. by 1980. At the same time, Canadian production is expected to rise to 1 to 1.4 million barrels per day by 1960 and to 2.8 to 3.8 million barrels by 1980.

Canada ranks second only to the United States in both per capita consumption of petroleum and in total consumption in the free world. Present requirements average about 15 bbls. of oil per person, which is about 75 per cent of the U. S. consumption. The vehicle population runs about one per four people and one home in every three is heated by oil.



CANADA'S REFINERY BUILDING PROGRAM is marked by complete revamping projects which amount literally to new refineries. Units like this two-stage crude distillation and fluid catalytic cracking installation at Imperial's Vancouver refinery are being added at the company's Halifax plant. This refinery is being rebuilt from the ground up.

these Quebec refineries will continue to process Latin American and Middle Eastern crudes for several years to come. In fact, the scheduled 1956 runs to crude stills in Montreal East and Halifax, N.S., will show a marked increase over 1955. This will result in an over-all increase in the percentage of imported crude runs from 45 per cent in 1955 to an estimated 46 per cent this year.

On net crude requirements however, Canada is gradually increasing its position. Last year for the first time in history, Canada shipped more crude to the U.S. than it imported from us. This year the southward flow into refineries in Washington, California, Minnesota, Wisconsin and Michigan is expected to amount to more than 105,000 bbl. per day, over six times the volume of Texas and Mid-Continent crudes which are imported into the Toronto area.

This growing trade with the U.S. will reduce Canada's net dependence on outside crude from 36 per cent last year to about 28 per cent this year. For 1956, Canadian refiners estimate that they will process 619,000 bbl. of crude per day. Of this, about 55 per cent will comprise domestic crude. Venezuela and to a lesser extent Trinidad will provide over 35 per cent of total requirements, while the Middle East, primarily Saudi Arabia, will supply about 7.5 per cent. The remaining 2.5 per cent of total requirements will comprise U.S. imports.

It is still too early to forecast Canada's 1957 crude sources with any degree of accuracy. But it appears that the Middle East will become a more important factor while U. S. imports may completely dry up in favor of Canadian crude.

At the same time, exports of crude to the U.S., which averaged 47,000 bbl. per day last year and may hit 92,000 this year, are due to increase still further. Plans are now under way for additional refineries to be built in the Pacific Northwest and the Northern Plains areas. They are designed to use Canadian crudes. It is further likely that Canadian crude will continue to flow in greater quantities into the Great Lakes area of the U.S.

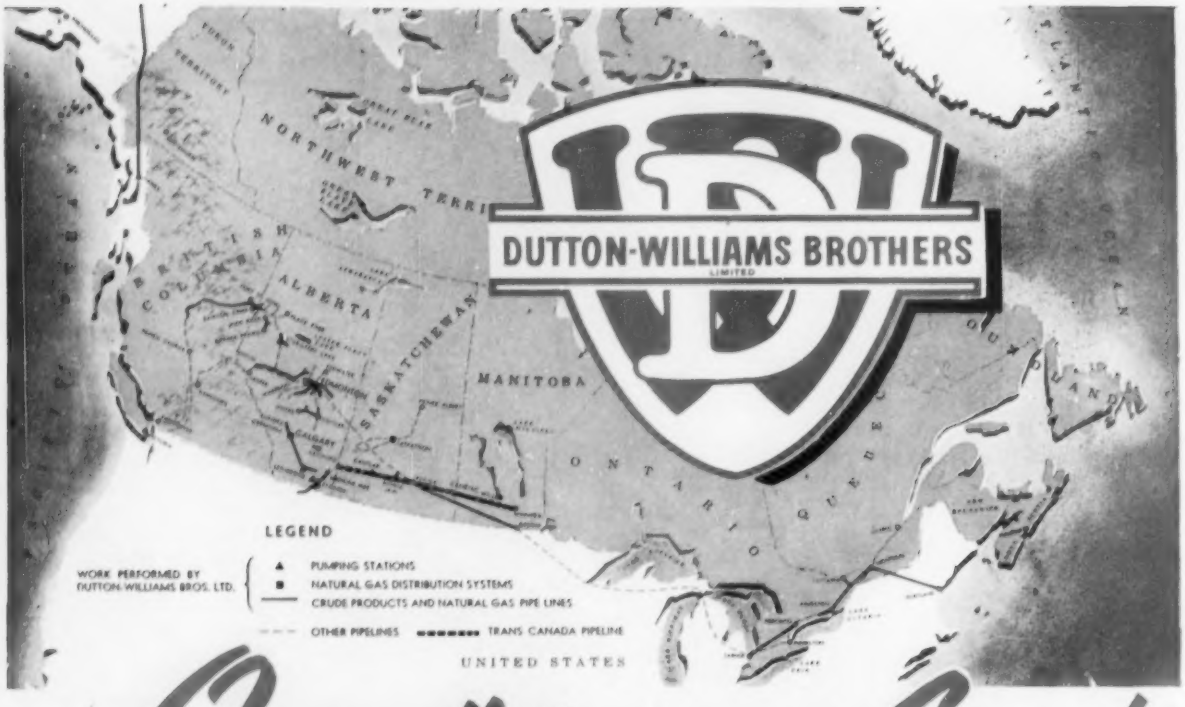
Domestic crude . . . Meanwhile, Canadian refining capacity will see its greatest increases over the next few years in those areas in which domestic crude is now or shortly will be available. Two U. S. oil companies are known to be seriously considering the building of their first refineries in western Canada. British Petroleum, Ltd., is now making a survey of the Canadian market, with the ultimate objective of constructing one or two refineries there.

British American Oil Co., Ltd., is nearing completion of its expansion and modernization programs in Montreal and Toronto and has stated that its next move will be a repetition of these programs in its western plants.

Shell Oil Co. of Canada, Ltd., has long been considering a third refinery to supplement the production of its Montreal and Vancouver installations. The independents, who comprise an important segment of Canadian refining, are not likely to lag the majors in new construction to meet the continuing demand rise. Predominantly western, they are expected to keep pace with Canada's fast-growing consumption trend with new, modern facilities all the way from British Columbia to Manitoba.

TABLE 2—SUMMARY OF CRUDE MOVEMENTS IN CANADA

Crude movements Avg. bbl./day To:	Canada in and out	
Maritimes and Quebec	1955	1956
From: Venezuela	185,750	209,000
Trinidad	2,180	2,180
(Latin Am.)	(187,930)	(211,000)
Middle East	22,480	45,000
Total	210,410	256,000
Ontario		
From: Western Canada	103,800	123,000
Ontario	1,550	1,500
U. S.	20,600	15,900
Venezuela	2,050	1,400
Trinidad	5,700	7,000
(Total L.A.)	(7,750)	(8,400)
Total	133,700	148,800
Prairie Provinces		
From: P.P.	134,320	157,000
British Columbia		
From: Alta.	48,600	57,500
Northwest Territory		
From: N.W.T.	1,100	1,100
Canadian Crude to:		
Michigan	0	12,150
Minnesota	9,950	36,100
Wisconsin	4,100	4,900
Washington	33,000	53,000
	47,050	106,150



Operating across Canada

Under blazing prairie sun, across quaking muskeg, through frozen Arctic wastes, Dutton-Williams Brothers Ltd. have built Canadian Pipelines under every climatic condition and over every type of terrain . . . and built them on schedule!

From the initial planning, through the complex problems of construction to continued maintenance of your project, Dutton-Williams Brothers is geared to meet the specific requirements of the Canadian Oil & Gas Industry.

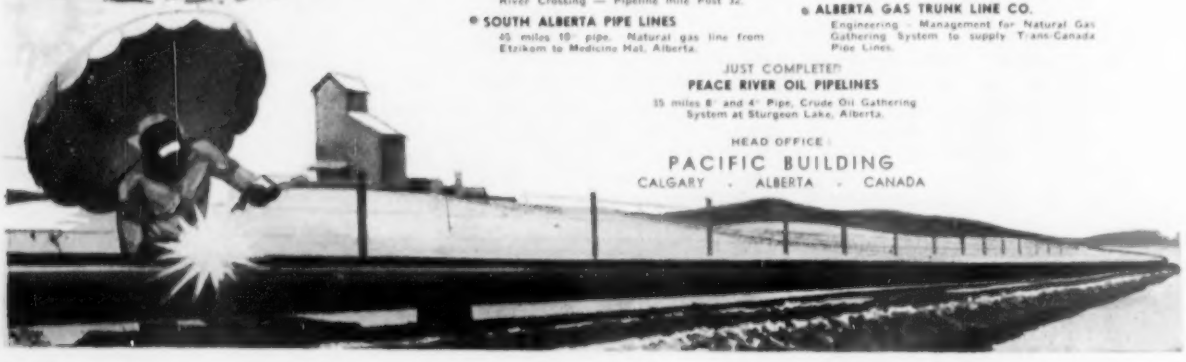
Backed by over 50,000 miles of pipeline experience, Dutton-Williams Brothers stand ready to serve the Oil Industry "From the Wellhead to the Consumer".

9 MAJOR PROJECTS UNDER WAY

- **MIDWESTERN INDUSTRIAL PIPELINES**
  33 miles 10" pipe. Natural gas line from Alexander Indian Reservation to Wabamun, Alberta.
- **NORTH CANADIAN OILS LTD.**
  136 miles 10" pipe. Natural gas line from Wabamun to Hinton, Alberta.
- **WESTCOAST TRANSMISSION CO.**
  120 miles 30" pipe. Natural gas line from Taylor to Azouzetta Lake, B.C.
- **WESTCOAST TRANSMISSION CO.**
  1,200-foot river crossing — 30" pipe. Pine River Crossing — Pipeline mile Post 32.
- **SOUTH ALBERTA PIPE LINES**
  45 miles 10" pipe. Natural gas line from Etzikom to Medicine Hat, Alberta.
- **CREMONA PIPE LINES**
  65 miles 8" pipe. Complete engineering and construction contract for crude oil gathering system and transmission line from Sundre — Westward Ho — Harmatton Field, to Calgary, Alberta.
- **CANADIAN GULF OIL COMPANY**
  4 miles 8" and 12" Pipe. Natural gas gathering line and injection line at Pincher Creek, Alberta. All welds to be field stress relieved.
- **TRANS-CANADA PIPE LINES**
  87 miles 34" pipe. Natural gas transmission line from Mile Post 300.5, Candiac, Sask., to Mile Post 387.8, Willen, Manitoba.
- **ALBERTA GAS TRUNK LINE CO.**
  Engineering - Management for Natural Gas Gathering System to supply Trans-Canada Pipe Lines.

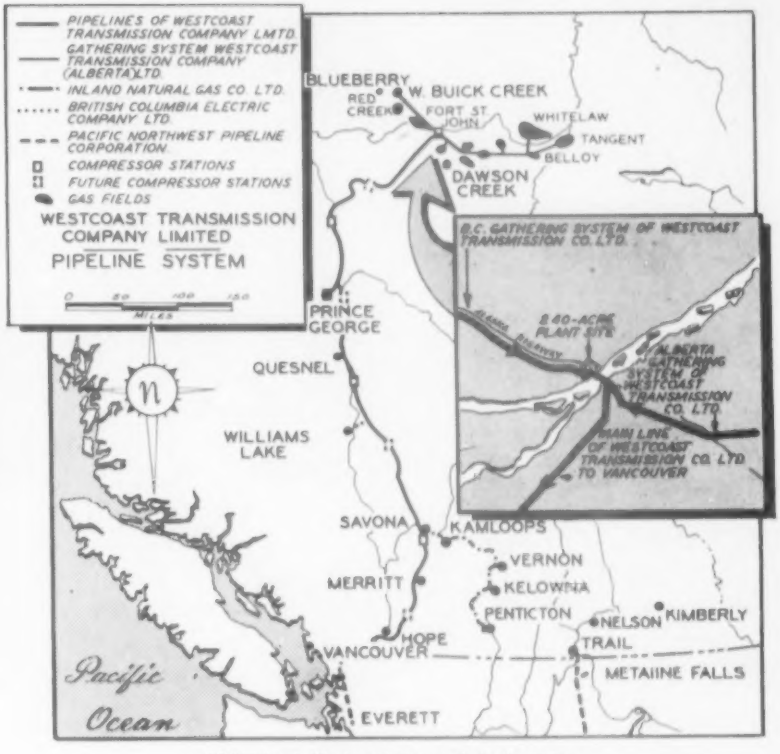
JUST COMPLETED
PEACE RIVER OIL PIPELINES
35 miles 8" and 4" Pipe, Crude Oil Gathering System at Sturgeon Lake, Alberta.

HEAD OFFICE:
PACIFIC BUILDING
CALGARY - ALBERTA - CANADA



CANADA'S FIRST BIG-INCH GAS PIPELINE

- Here's its story—with emphasis on design features and laying techniques



ROUTE of Westcoast Transmission's system.

by Charles R. Hetherington and D. R. Pflug

CANADA—Where Oil Is King

WESTCOAST TRANSMISSION, Canada's first large-diameter gas pipeline, is presently under construction. After years of delay in securing authority from various governmental bodies, clearing of right-of-way was commenced this past winter and the contractors are now busy using the summer weather to push the laying of pipe. The 650-mile 30-in.-diameter line is scheduled for completion by November 1957 at a cost of approximately $153,000,000. The four mainline contractors are Canadian Bechtel, Ltd., of Vancouver, B. C., Conyes Construction Corp. of San Pablo, Calif., Dutton-Williams Brothers, Ltd., of Calgary, Alta., and Mannix, Ltd., of Calgary.

Pacific Petroleums, Ltd., an aggressive Canadian independent, under the leadership of its chairman of the board, Frank McMahon of Calgary, is the principal sponsor of Westcoast Transmission. Many obstacles have been overcome in organizing the $153-million project. As the pioneer advocate of the sale of large quantities of surplus Canadian gas in the United States, it was necessary to first elicit a policy from the various federal and provincial governments and then apply for the enactment and amendment of numerous acts and regulations to make the proposition feasible.

The transmission pipeline system will carry gas from the Peace River area of Alberta and British Columbia to the international border near Sumas, Wash. It will tap one of the largest-potential gas-gathering areas in Canada, for some 60 million acres of highly gas-producing land lie adjacent to the pipeline.

Gathering and processing . . . Westcoast will construct an extensive gathering system from the dry, sweet gas fields in Alberta and the sour, wet gas fields encountered in British Columbia to terminate at Taylor Flats, B. C., just south of Fort St. John. Approximately 130 miles of main field-gathering lines ranging in sizes from 12 to 26-in. will be constructed initially. A large processing plant is presently under construction at this point by Westcoast and Pacific Petroleums for removal of the liquid hydrocarbons and sulfur.

Two-phase flow will be utilized in the gathering-system pipelines from the wet gas fields with glycol wellhead dehydration units for the removal of water from the stream being provided by the producers. A 20° F. dewpoint will be required to prevent hydrate formation in this area where ambient temperature sometimes reaches —60° F. and frost penetration near 8 ft. Through-conduit valves and pig traps will be installed in the main gathering lines. After processing, the gas will be further dehydrated to ensure a 3-lb. water-vapor specification.

The dry sweet gas from the Alberta fields will not require processing other than wellhead dehydration to meet pipeline-gas specifications of a 3-lb. water-vapor content. Compression of this gas will be required before it enters the main transmission line. This will be done at the No. 1 Compresser Station adjacent to the processing plant.

Sales will be made to Inland Natural Gas, Ltd., for transmission and distribution in the Cariboo, Okanagan and Kootenay areas and to British Columbia Electric Co., Ltd., for trans-

Charles R. Hetherington is a vice president of Westcoast Transmission Co., Ltd., and D. R. Pflug is vice president and chief engineer.

CLEARING OF RIGHT-OF-WAY started in winter in Peace River area. Much of line route is through heavy timber like this.

CANADA—Where Oil Is King

mission and distribution in the lower Fraser River district, including Vancouver. The balance of the gas, approximately 75 per cent of the throughput, initially will be delived to the Pacific Northwest Pipeline Corp. near Sumas, Wash., for transmission to the fuel-hungry northwestern states.

Right-of-way features . . . The Westcoast pipeline for most all of the route will parallel all-weather highways and railroads, traversing, for the most part, good pipeline-laying country. Commencing at the Alaska Highway crossing of the Peace River, at an elevation of 1,500 ft. above sea level, it will parallel the John Hart Highway through the Pine Pass of the Rocky Mountains, reaching an elevation of only 2,900 ft. above sea level.

From here it travels south through the valleys of the Parsnip and Fraser rivers, paralleling the highway and the Pacific Great Eastern Railway through the towns of Prince George, Quesnel, Williams Lake, and 100-Mile House in the interior of British Columbia. Continuing cross-country via Savona on the Thompson River, the line arrives at Merritt on the Canadian Pacific Railway. Following the railway south of Merritt through the valleys of the Cold Water and Coquihalla rivers, the pipeline reaches Coquihalla Station.

Immediately south and west of here it crosses Boston Bar Pass of the Coast Range at an elevation of 4,700 ft. and descends the Boston Bar Creek to Portia Station. By following this route the gas pipeline will avoid the more difficult parts of the Coquihalla Canyon already occupied by the Trans Mountain Oil Pipeline and Canadian Pacific Railway. From Portia the line continues via Hope and Chilliwack to the terminus near Sumas, Wash., at an elevation of 100 ft.

Approximately 80 per cent of the line has forest cover to some extent with a considerable amount of heavy timber in some locations. Clearing is being carried out with various combinations of men and equipment, ranging from axes and power saws to bulldozers and

WELL POINTS are required along the south part of the line near Vancouver. Water table here is very high and ditch won't stand up without well points.

MISINCHINKA VALLEY 10 miles below Pine Pass is typical of terrain. Note road in center of photo.

fork-lift tractors. A minimum 50-ft. right-of-way is being cleared throughout most of the line.

Winter clearing was undertaken primarily to eliminate as much as possible the danger of the forest fires from brush burning in dry weather. The severe winter with attendant deep snow and the difficulty of grubbing frozen stumps resulted in slower progress than expected. Despite these handicaps over 50 per cent of the right-of-way has now been cleared.

The line will require the installation of eight major river crossings. Modern suspension-type bridges will be used on six of these crossing with clear spans ranging from 480 to 1,675 ft. Included are the Peace River, three crossings of the Fraser River, the Quesnel, and the Thompson rivers. Submarine crossings of the Pine and Parsnip rivers will be constructed.

The main line is divided into four construction schedules with mileages numbered from north to south. Dutton-Williams Brothers, Ltd., have schedule No. 1 from Mile Zero to 120, Bechtel from Mile 120 to 330, Conyes from Mile 330 to 540, and Mannix from Mile 540 to 650.

The 30 by ⅜-in. pipe, conforming to API5LX52 specifications, is being shipped by Consolidated Western, A. O. Smith, Republic Steel, Colorado Fuel & Iron, and South Durham Steel & Iron Co. of England. Rigid specifications are being adhered to by the manufacturers of pipe and special fully killed steel plate will be used in exposed pipe for the spans. River crossings and special installations call for 30 by ½-in. wall pipe.

Through-conduit-type valves with pig traps will be installed in the first 150 miles out of the field and the balance of the line will have lubricated plug valves with recovery tubes. All valves will be equipped with operators.

AERIAL CROSSING of Peace River was made early in year. Six major crossings are by suspension bridge.

CANADA—Where Oil Is King

Laying practices . . . Conventional stringing operations are being carried on though long hauls are required at the northern end from the railway terminals at Prince George and Dawson Creek.

An estimated 70 miles of rock ditch will be encountered with the most difficult stretches through the Rocky and Coast Range Mountains. The extremely high water table encountered in the southern portion of the line from the U. S. border to Hope, B. C., has required dewatering of the ditch with well points and an extensive use of anchors and weights.

The trench is being dug to a minimum width of 48 in. for the 30-in. pipe and normal cover will be 36-in. between the top of the pipe and graded right-of-way. In rock the minimum cover will be 24 in. and in the muskeg and swampy areas 30 in. of cover is being provided. Two types of coating are being used on the pipeline. One, a wax-base coating with a single wrap followed by kraft. The other asphalt primer, filled asphalt with inner and outer glass wrap.

Standard-pipeline-welding procedure is being followed. When the ambient temperature is such that the quality of the weld will be affected, preheating of the pipe is required. One contractor has set up a double joining plant and 80-ft. sections are being used in this section. In general, the design and construction of the pipeline is in accordance with the specifications as set forth

in the 1955 A.S.A. B 31.1 Section 8 Code for pressure piping.

As the end of June was approaching, contractors had lowered in and tied in better than 50 miles of the pipeline and had received close to 400 miles of 30-in. pipe. With summer weather now being experienced throughout the length of the line, contractors were moving along at a rapid pace to lower in a scheduled 80 per cent of the line during the first construction season.

Engine-Driven Centrifugal Stations

The 30-in. line as designed and powered initially will be capable of handling approximately 400 M.M.c.f.d. when operating at a maximum line pressure of 881 psia. Four compressor stations, Nos. 1, 3, 5, and 7, are scheduled for installation in the first stage of construction with an aggregate 52,500 hp. When the line is fully powered, approximately 185,000 hp. at nine compressor stations will enable the delivery of 660 M.M.c.f.d.

At Station No. 1, seven Ingersoll-Rand KVS-412, 2,000-hp. reciprocating compressor units are being installed. This station serves primarily to compress the lower pressure, dry sweet gas received from Alberta fields to main-line pressure. However, units are manifolded and fitted so that sour gas from the British Columbia fields can also be compressed.

A comparatively new type of compressor unit will be installed for compressing the gas at Stations 3, 5, and 7. Four De Laval centrifugal compressors, driven through speed increasers by Nordberg 3,500-hp. supercharged gas engines operating in series and utilizing straight-through compressor piping, are being installed at the first two line stations Nos. 1 and 3. No. 7 Station will also have this type of compressor unit except only three units will be required initially.

Because of the extremely low winter temperatures requiring considerable heating, the main compressor and auxiliary building have been combined with a concrete fire wall separating the two. A full basement is being provided for engine auxiliaries inasmuch as foundations require a minimum depth of 8 ft. because of frost penetration. Heating will be accomplished by a boiler hot-water system, augmented with heat from the engine exhausts. Fully insulated side wall and roof construction is also required to keep operating room temperatures at a satisfactory level.

Station No. 1 will obtain electric power from the adjacent gas-processing plant. The source of water will be from the Peace River which adjoins the property and at other stations well water will be available. The process water from the gas plant on its return to the river will be utilized to cool the circulating engine jacket water and lube oil through shell and tube exchangers. A closed blended-type circulating water-cooling system will be employed at all stations. Fin-Fan forced-draft coolers will be installed at the centrifugal stations and will be completely housed with automatic louvers on the roof and rollup doors for the sides.

Compression ratios will approximate 2.5 at the field station, where after cooling of gas will be required, and 1.5 at the booster stations for the 400 M.M.c.f.d. capacity.

An extensive central-control system for station operation will be installed, utilizing both pneumatic and electric type of controls, which will enable possible future remote control of stations.

Necessary housing will be constructed at the stations to provide living quarters for station personnel.

Canadian Bechtel, Ltd., with offices in Vancouver, is manager of engineering and construction for the project. Ford, Bacon & Davis of Canada, Ltd., Vancouver, is handling the design of compressor and meter stations and is consultant to Westcoast.

PIPELINES are NOT SIDELINES with...
WILLIAMS BROTHERS
ENGINEERS and CONSTRUCTORS
OIL • GAS • WATER
PRODUCTS PIPELINES
PUMPING STATIONS
RECENTLY COMPLETED
Oleoducto del Pacifico
Colombia, South America
HDT BLDG • TULSA, OKLAHOMA • CABLE ADDRESS: WILLBROS
New York • Washington • Louisville • Minneapolis • New Orleans
CANADA • BOLIVIA • COLOMBIA • ECUADOR • VENEZUELA
ENGLAND

J&L Service

wraps up the world's most wanted

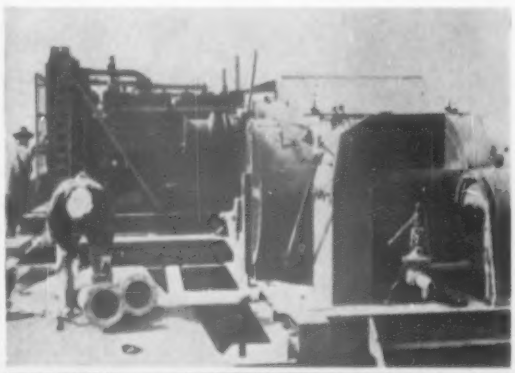
Rotary Rigs

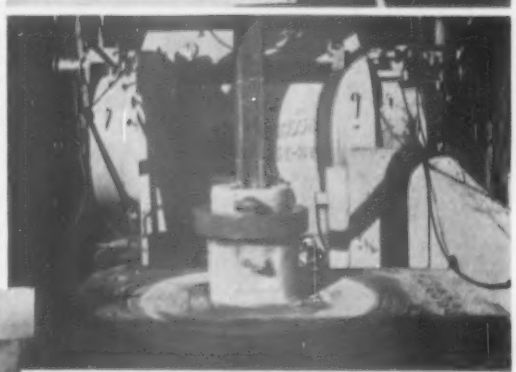
A driller's natural desire to own the last word in equipment has made Ideco the most wanted rotary rigs in the world.

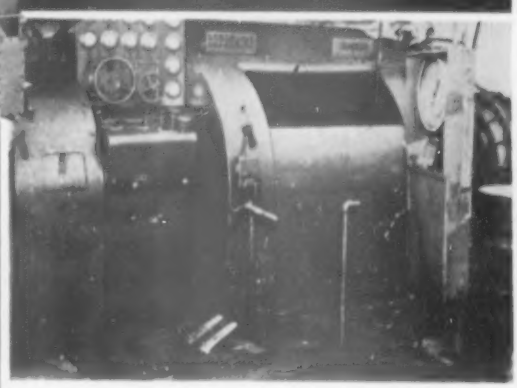
J&L parts service wraps up this situation — makes these finest of all rigs the best buy in the United States and Canada.

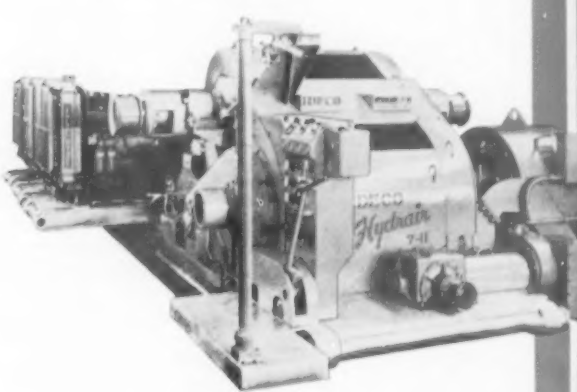
J&L has an Ideco designed and rated to do the job you have in mind and — thanks to J&L service — keep on doing it.

For detailed descriptions, specifications, performance characteristics, get your J&L store on the telephone. Ask for Catalog No. 55.









Rig capacities from 2,500' to 20,000' with 4½" drill pipe. Rigs to 6,000' capacity can be trailer mounted.

"Hydrair" hoists combine a hydraulic torque converter drive with air clutch and air controls.

Power rigs have a mechanical or fluid-coupling drive, with air clutch and air controls.

Jones & Laughlin

SUPPLY DIVISION – Tulsa

SERVING THE UNITED STATES AND CANADA

J&L SUPPLY

10-M

Gravity—An Accurate Exploration Tool

. . . for Canadian foothills belt—here's why

by W. F. Stackler

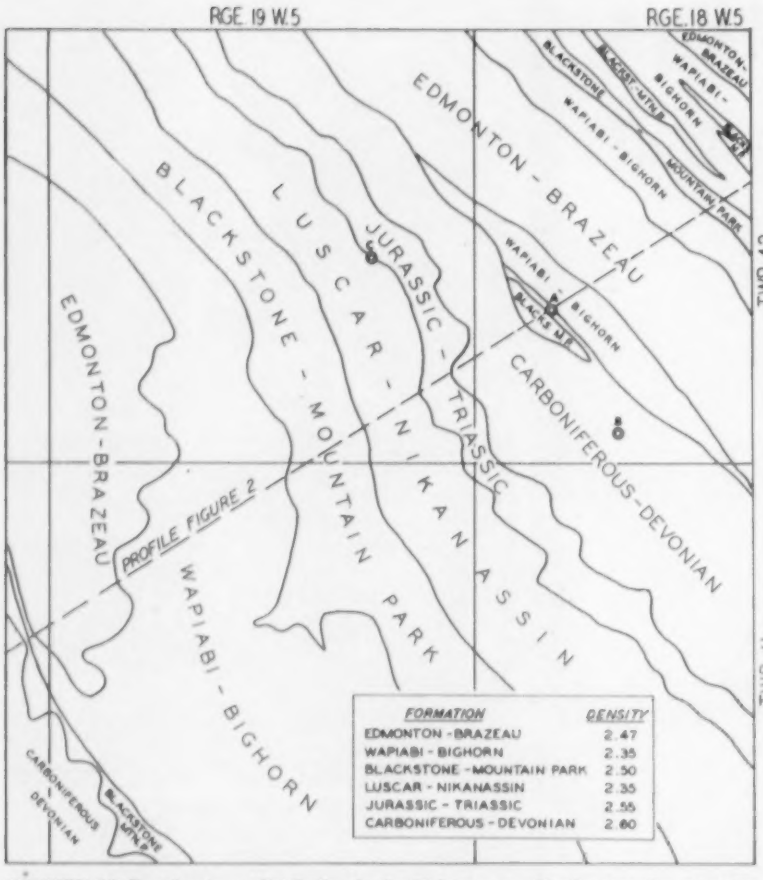
THE possibilities of gravitational prospecting for faults and anticlines of Turner Valley type* are excellent in the disturbed foothills belt of Alberta, northeastern British Columbia, Northwest Territories, and northern Yukon.

The greatest objection to gravity surveys is the difficulty in getting suitable results if the topography and the density distribution on the surface are complex. The purpose of this article is to outline these difficulties and to show ways to eliminate them.

The final interpretation of gravitational results is probably much easier in the foothills than in the plains. The main reason that sometimes the results of gravitational surveys close to the mountains are not clear is not a failure of interpretation, but that insufficient reduction methods have been applied to the field readings.

These reductions, terrain and Bouguer, have the purpose of making the actual field readings comparable by reducing them to a datum plane. In the plains of Alberta, these reductions are small. The density close to the surface is more or less uniform; because of only small undulations in elevation, the datum plane can be chosen close to the surface.

In the foothills belt and right in the mountains these conditions change en-

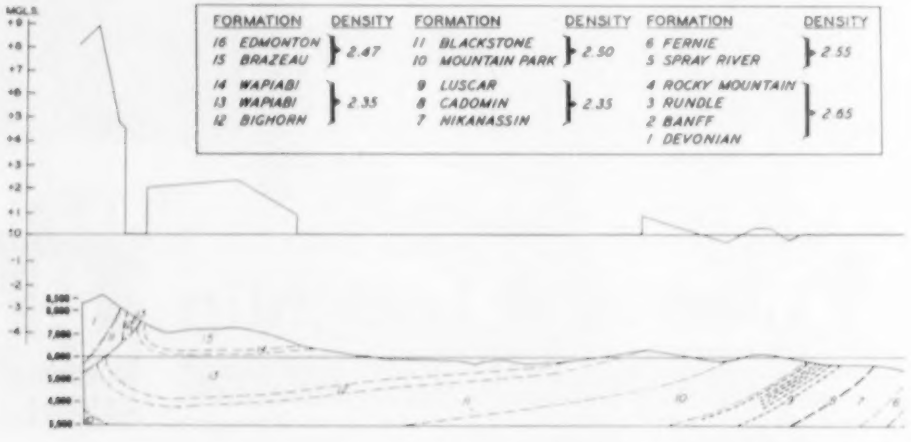


DENSITY MAP and outcrop distribution in the Bighorn area. Northeast-southwest profile is shown in Fig. 2 below. Fig. 1.

The author is a consulting geophysicist, Calgary.

*See "Can Gravity Surveys Map Subsurface Structures," The Oil and Gas Journal, November 14, 1955, p. 263.

CANADA—Where Oil Is King



DIFFERENCE in Bouguer reduction using 2.35 as average density and the exact density. Fig. 2.

tirely. Because of much larger changes in surface elevations, the reductions to the datum plane are much greater and the most important factor is the lack of a uniform surface density.

As an example, the Bighorn basin area shows these difficulties. Within the basin, surface elevations range from 5,000 ft. along the stream beds to 6,500 ft. at the crest of the surrounding hills. The peaks of the Front Range of the Rocky Mountains along the boundary of the basin rise to 9,500 ft. and peaks on the Bighorn Range to the east average 8,500 ft. in elevation. Spruce and jack pine cover the slopes and the terrain is unsurveyed. There are few trails in the area; an actual gravity survey has to be accomplished mainly on horseback or on foot.

Due to the high perfection of the gravimeter, no difficulties exist in obtaining an accuracy of 0.03 milligals in instrument reading itself, even under such adverse field working conditions. Remember that the valuation estimation of any surveyor's field work is not higher than the largest possible error of the reductions made. A skilled survey crew will turn in field data that are as accurate as gravity instrument readings. Lately, there have been attempts to run elevations with barometers. It is doubtful if such a gravity survey can give more than just a rough gravity picture. Even with the greatest care in aneroid barometer readings, the average accuracy is less than 3 or 4 ft. with some values 10 ft. off in elevation.

Working in the foothills area brings up the problem of the Bouguer and terrain reduction. To attempt to save time and money in making these corrections would be a mistake. The high valuation of the instrument readings would be destroyed. Therefore, in mountainous country, the errors in terrain reductions and in density assumptions represent the error of the whole gravity picture.

The working conditions to obtain suitable results in the Bighorn basin are really rough. Most of the foothills areas should be more favorable for gravity work. This area was not selected to point out any geological possibilities for structures in this special part, but to emphasize the difficulties. No actual gravity survey is used for this paper. The sole purpose is to show how to get sufficient reductions in terrain and Bouguer.

TABLE 1—RADIAL DISTRIBUTION OF BOUGUER REDUCTION IN PER CENT
(Radius R in units of h)

	Zone 1 R = 0 — 0.25h	Zone 2 R = 0.25 — 0.5h	Zone 3 R = 0.5 — 1h	Zone 4 R = 1 — 2h	Zone 5 R = 2 — 3h	Zone 6 R = 3 — 4h	Zone 7 R = 4 — ∞h	Sum of Zones 1-7
Per cent of Bouguer red.	38.2	20.4	17.8	7.4	3.9	2.4	9.9	100% = Bouguer red.

The Bouguer Reduction

Fig. 1 shows a surface-density map. The legend shows the correlation between the surface geology and the density distribution. The surface geology is based on the interesting paper by B. R. MacKay.* Generally, the best source of density values for the single layers is the density determination of outcrop samples in the area. In the special case of this paper, and only as an experiment, average densities of the more distant surroundings are used.

Fig. 2 represents a geological profile of the area; the location is marked on the map in Fig. 1. The diagram above the profile shows the deviation in milligals of a Bouguer reduction using an average density of 2.35 against the correct Bouguer reduction using the local real density. This deviation is a function of the elevation distance from datum plane and of the density error. A datum plane of plus 6,000 ft. above sea level was used. With another datum plane, another density would change the picture, of course.

The Bouguer reduction takes away the leveled masses present above the reference plane and adds missing masses beneath. With the Free-air reduction, this reduction brings the actual field values from the surface to the datum plane and makes the observed points of the survey comparable.

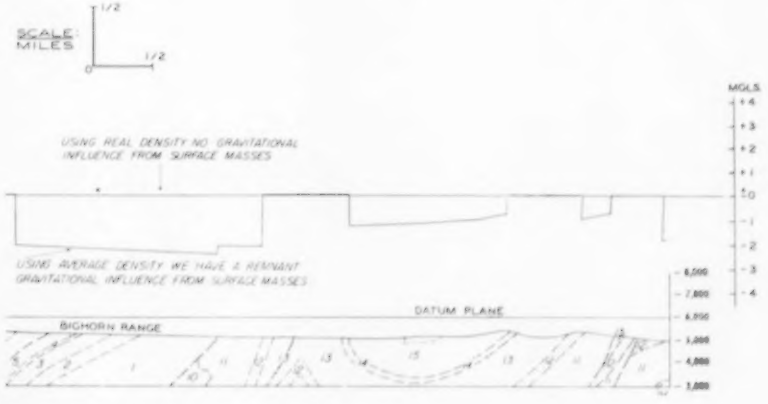
The deviation curve on top of Fig. 2 is the remnant of gravitational mass influence above or below the reference plane, because of the average density chosen in error. In an actual gravity survey, this remnant represents an error that would superpose the gravitational influence of the structures below the datum plane and would alter their results. Therefore, a density map is essential for the gravitational interpreter in mountainous areas. Only extensive knowledge of the densities enables him to correct with the right density and thus attain accurate results.

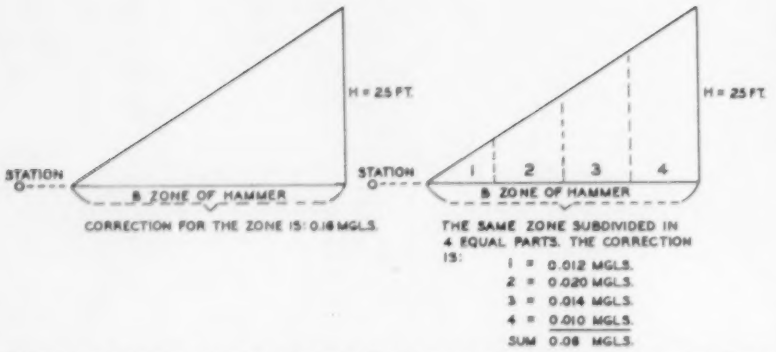
Without geological knowledge, and without a density map, the Bighorn Range with Devonian on the surface would appear as a zone of mass deficit, as shown on the profile. As previously noted, the possibilities of finding faults and anticlines by gravity surveys are excellent; however, we have to add that all available geological information, and a carefully calculated density map, are needed to eliminate errors in the reductions.

Effect of dip . . . Now, another problem inherent in the geological conditions of the foothills will be discussed. For making the Bouguer reduction, the interpreter subtracts or adds the attraction of a horizontal mass slab; this slab has the same thickness as the elevation difference between datum plane and the station. As density, the average value expected between both elevations is used. This method is correct if the geological layers are horizontal and each layer is uniform in density.

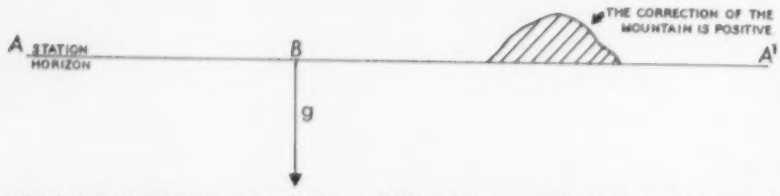
The Bighorn example is different. The layers are dipping at high angles with sudden lateral density changes. In such cases, the need of correcting the Bouguer reduction because of this change should be checked. Not only the mass between the datum plane and the station is important for the Bouguer reduction, but also the neighboring masses between both elevations have influence. The fraction of the Bouguer reduction resulting from a concentric cylindrical mass is constant, if the radius R is measured in units of h. In order to show the influence of the neighboring masses, the per cent distribution of the Bouguer reduction as function of the distance R in units of

*"George Creek, Alberta, 1940," No. 40-17, Geological Survey, Canada, Dept. of Mines.

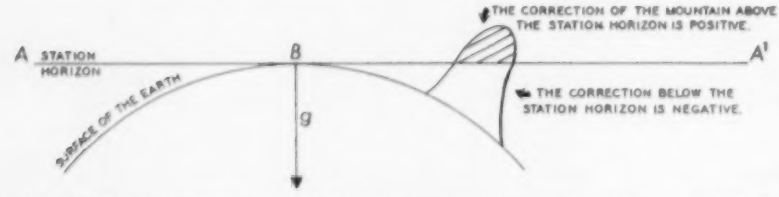




ZONE B of Hammer's Terrain Reduction Tables is too large in mountainous areas. Fig. 3.



THE ASSUMPTION for terrain reduction considering the surface of the earth as a plane. Fig. 4.



THE ASSUMPTION for terrain reduction considering the curvature of the earth. Fig. 5.

the elevation difference h between datum plane and station is given in Table 1.

If we have, for example, no change in density around the station to a distance equal to the elevation difference h, we know that 38.2 + 20.4 + 17.8 = 76.4 per cent of the Bouguer reduction are exactly corrected. In other words, a density assumption for all the masses at greater distance than h, with an error of as much as 12 per cent, will result in an error of 3 per cent of the Bouguer reduction. In practice, the actual density values will be considered to a distance of at least 5h, this yielding an accuracy of less than one per thousand.

In calculating the correction of the Bouguer reduction from the density map, the approved method of templates was used. The radii of the single zones used are: ⅛, ⅛, ¼, ½, 1, and 2 miles. For 3 points, A, B, and C, marked on the map, Fig. 1, the fraction of the single density areas for each zone in per cent were estimated from these values the correction of the Bouguer reduction was calculated. The results are shown in Table 2.

Point A is an assumed station with a sudden change in density in its vicinity. The Bouguer reduction combined with free air for 900 ft. elevation difference against the datum plane is —54.79 milligals and the sum of all corrections because of the density map is —1.30 milligals. The importance of such a correction in the Bighorn basin is recognized to insure useful results.

The Point B is chosen as an example to show that a station ½ mile away from a density border has disappearing corrections, even with the given elevation difference from the datum plane of 2,000 ft.

The Point C is situated on the border between two density areas. Its correction is 0.62 milligals.

This correction is necessary for the Bouguer reduction in an area with rapid changes in geology close to the surface; without such a correction the gravity survey would be inaccurate in a mountainous area. For an experienced worker, the detailed correction using the density map can easily be made. He will soon find out the stations which need no correction. For the other stations, he will use a standard template and a correction table to get results quickly.

CANADA—Where Oil Is King

The Terrain Reduction

The second important reduction is the terrain reduction.

Since 1939, Hammer's terrain correction tables[1] have been in use. These tables are published for hilly terrain but not for real mountainous areas. In the vicinity of the station, these tables are divided in the Zone B (6.56 to 54.6 ft.); Zone C (54.6 to 175 ft.); and Zone D (175 to 558 ft.). This zone division is sufficient for a normal hilly area. But they are not designed for the foothills where fast changes in terrain elevation occur close to the station.

Fig. 3 shows an example for the Zone B with an assumed terrain distribution. With an average elevation of 12.5 ft., Hammer tables show a correction of 0.16 milligals for this zone. By subdividing this zone into four equal parts and calculating for each part its own average elevation, the correction is only 0.06 milligals together. This proves that the inner zones of the Hammer tables are too large. And, in mountainous areas, the zones must be subdivided.

In 1940 Schleusener[2] calculated tables for mountainous areas with much smaller zones. His division in zones for the inner part is: 0 to 3; 3 to 5; 5 to 10; 10 to 20; 20 to 30; 30 to 50; 50 to 70; 70 to 100; and 100 to 200 m. To perform the terrain reduction, it is necessary to distinguish among three parts of corrections:

1. The reduction in the vicinity of each station covering the zone B to D of Hammer or the above-mentioned zones of Schleusener. This part has to be done in the field by a very experienced crew.

2. The reductions taken from the topographic maps for the greater distance, covering the zones E to M =

TABLE 2—CORRECTIONS OF COMBINED BOUGUER AND FREE-AIR REDUCTION

Point	Station elevation (ft.)	Station density	Bouguer reduction without correction, milligals	Corrections in the single zones in milligals—zones in fraction of mile						Sum of corrections, milligals	Corrected Bouguer reduction, milligals
				0-⅛	⅛-⅛	⅛-¼	¼-½	½-1	1-2		
A	5,100	2.6	—54.79	—0.22	—0.27	—0.39	—0.28	—0.10	—0.04	—1.30	—56.09
B	8,000	2.6	121.76	.	.	.	.	0.08	0.07	0.15	121.91
C	6,500	2.55	30.76	0.19	0.12	0.13	0.09	0.06	0.03	0.62	31.38

With a Totco Recorder you have simplicity of operation, sustained *accuracy* in recording, and durability. What's more, these famous instruments are constantly being modified and improved. You can depend on your Totco even in the deepest, hottest wells.
Be sure you know, use Totco!

Accurate as a timepiece

TOTCO

Technical Oil Tool Corp., Ltd. • *1057 North La Brea Avenue, Los Angeles 38, California*

Exclusive Distributors: *California*—The Republic Supply Co. of California; *Domestic*—The Continental Supply Company; *Canada*—Oil Well Supply Company; *Export*—Lucey Export Corp., New York City

558 ft. to 13.64 miles distance, by Hammer, or zones 0.2 to 20 km. by Schleusener.

3. The reductions of the Rocky Mountains, zones 20 to 450 km. by Schleusener.

Topographic maps . . . Topographic maps are needed to perform the second part of the terrain reduction. It is possible and necessary to work out a map using the available aerial photographs. Such maps contoured in the correct way are accurate enough for our purpose. For the first mile from the station, the best method is the use of the altitude lines to get an average elevation for the compartments of the zones.

Farther from the station the altitude lines should be worked out in equal squares of average elevation (¼ sq. mile); calculating machines will give the required average elevations of the single compartments. In the outer zones it is not necessary to calculate the corrections for each station. Interpolations for intermediate stations are correct if the single station elevation is considered.

Part 3, the correction of the mountains beyond the zone M (9.16 to 13.64 miles by Hammer) cannot be done with the method of Hammer table because of the curvature of the earth. Fig. 4 shows the assumption of Hammer. This assumption of a plane is accurate enough for Hammer's zone B to M. However, beyond the last zone the curvature of the earth must be considered.

Fig. 5 shows the situation in an exaggerated vertical scale. Only the parts of the mountains above the horizon AA have a decreasing influence of the vertical attraction for the Station B. The influence of the mountains below the horizon increases at attraction. Therefore, the correction of the mountains with a distance of 100 miles and more is only negative. In the textbooks of gravity, the terrain correction is always positive. This is not correct. Remote mountain masses may require a negative correction.

Calculate this influence on a few corner points in a greater area to estimate the linear change of this correction for each point. For small projects, the influence is more or less constant and can be omitted.

The importance of exact corrections in the Bouguer and terrain reduction is obvious. These detailed corrections are time-consuming, but these hints should bridge over the inconveniences. Then gravity can be an accurate tool for the geologist to explore the foothills belt.

References

1. Sigmund Hammer, "Terrain Corrections for Gravimeter Stations," Geophysics 6 (1939), pp. 184-194.

2. A. Schleusener, "Nomogramme for Gelandeverbesserung von Gravimeter-Messungen der angewandten Geophysik, Beitrage zur angew," Geophysik Bd8 (1940) pp. 415-430.

Canada's Untapped Oil Land holds the Key to a

GOLDEN FUTURE

Today, Western Canada's explored oil lands have brought forth an oil reserve of over three billion barrels. But in years to come, this reserve may be dwarfed into insignificance by the yield of our now-unexplored oil lands.

The key to this golden future is in the earth of Western Canada. The project ahead is tremendous but the opportunities are limitless, not only for those who seek the oil, but for those who will risk a part of their funds for this purpose.

As underwriters of Canadian oil securities, one of the objectives of Burns Bros. & Denton is to provide its facilities to both of these groups, to help unlock the oil reserves of the future.

We invite your enquiries

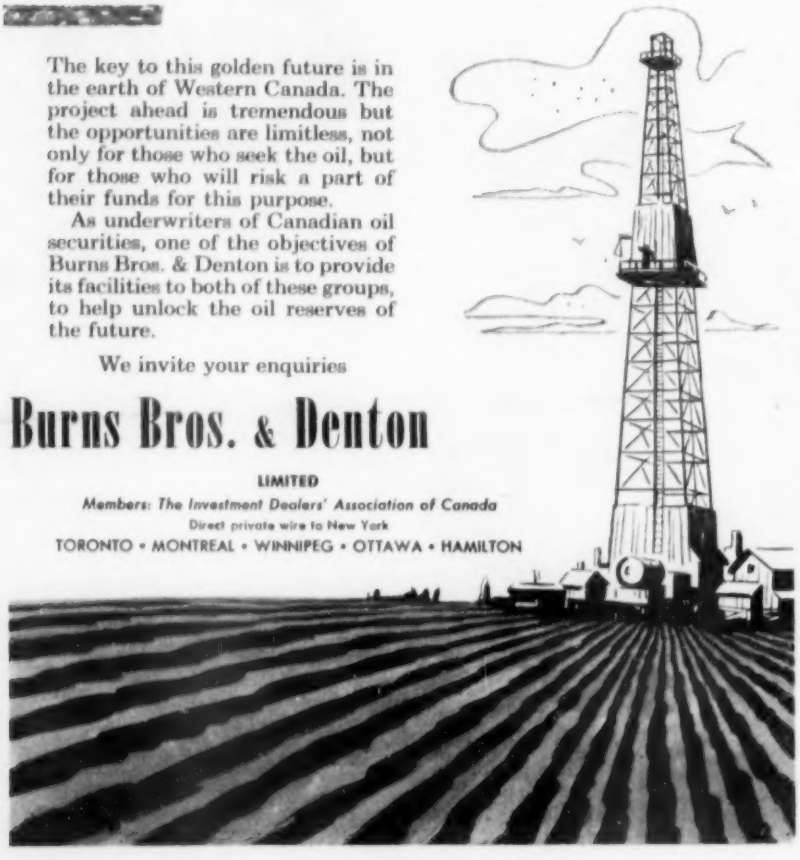
Burns Bros. & Denton

LIMITED

Members: The Investment Dealers' Association of Canada

Direct private wire to New York

TORONTO • MONTREAL • WINNIPEG • OTTAWA • HAMILTON



BOOKS

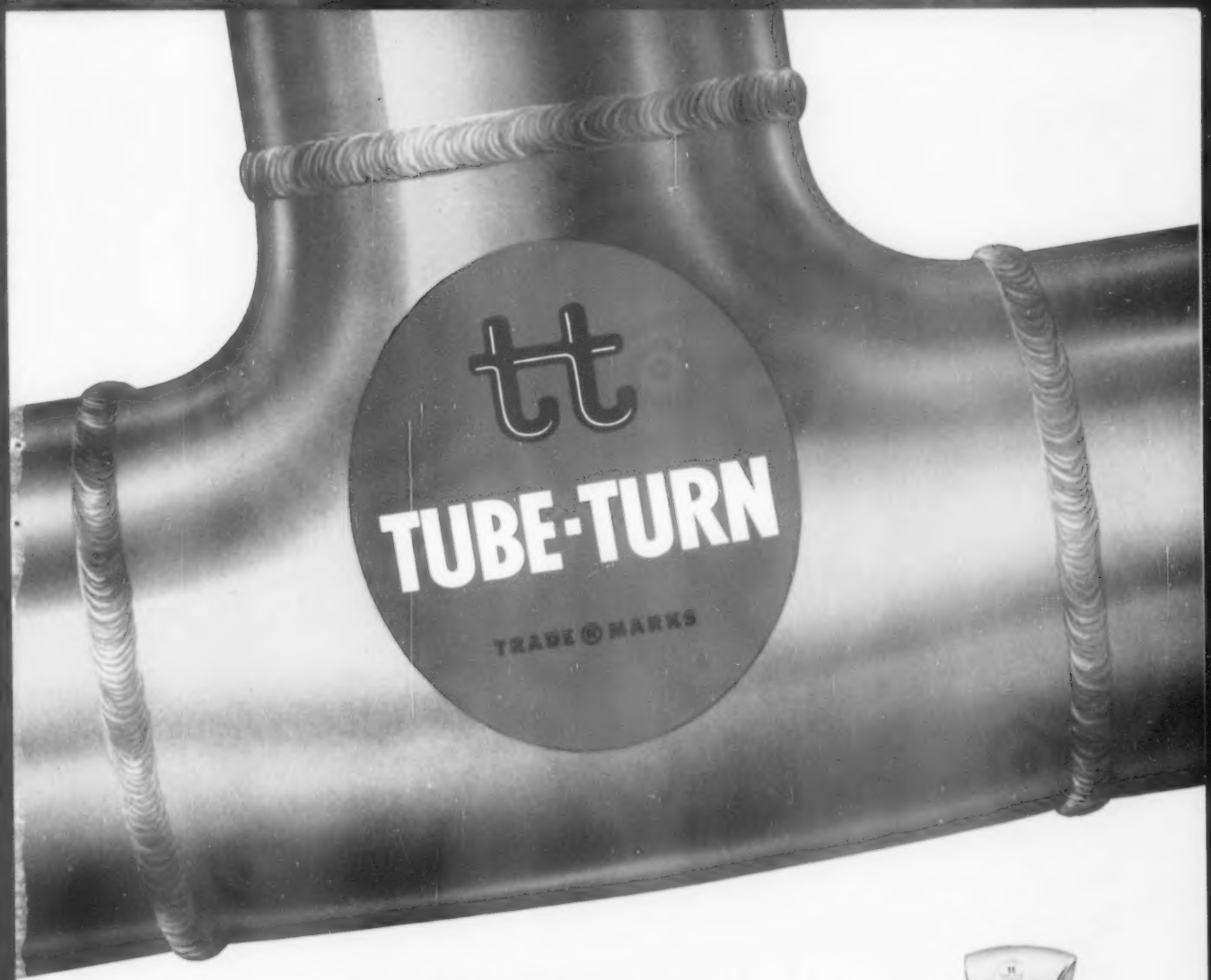
PANEL DISCUSSION ON PYROMETRIC PRACTICES. Published by A.S.T.M., 1916 Race Street, Philadelphia 3. 78 pp., heavy paper cover, $1.50.

Here a discussion of work in the field of temperature effect on properties of metals is presented. Much interest centers in defining the precision of temperature measurement and control which can be recommended or specified in high-temperature test work.

DISTILLATION IN PRACTICE. Edited by Charles H. Nielsen. Published by Reinhold Publishing Corp., 430 Park Avenue, New York 22, 140 pp., $3.

This also is based on the "Experience in Industry" symposium. Again authorities on each subject in industry have contributed some excellent chapters on "Tower Design from a Process Viewpoint"; "Physical Design Features of Plate Columns"; "Some Techniques in Petroleum Fractionation"; "Distillation Control"; "Operation of Distillation Equipment"; and "Some Commercial Aspects of Vacuum Distillation."

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.



In **ALUMINUM** too

here's how to get more for your money!

Call your nearby Tube Turns' Distributor. He can fill *all* your needs in welding fittings and flanges—aluminum as well as other piping materials. He provides industry's most complete line—over 4,000 top quality items—different sizes, types, schedules, materials; hence, this one source saves you purchasing time, cuts red tape. He acts as your warehouse. He gives you prompt delivery. And through him, Tube Turns' Engineering Service gives you valuable application help. To take advantage of this cost-cutting service, specify and buy TUBE-TURN Welding Fittings and Flanges.

*"TUBE-TURN" and "tt" Reg. U.S. Pat. Off.

The Leading Manufacturer of Welding Fittings and Flanges

TUBE TURNS

LOUISVILLE 1, KENTUCKY

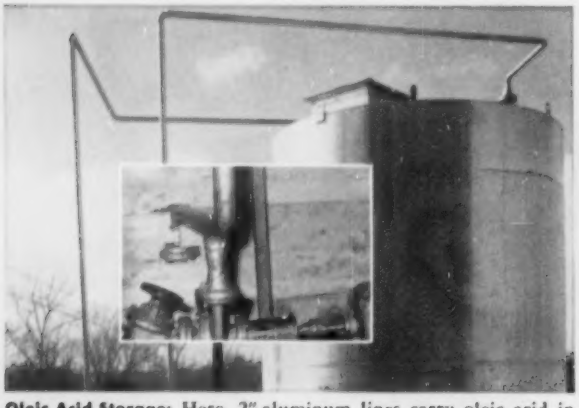
A Division of National Cylinder Gas Company

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Cleveland • Detroit • Chicago • Kansas City • Denver
Los Angeles • San Francisco • Seattle • Atlanta • Tulsa • Houston • Dallas • Midland, Texas

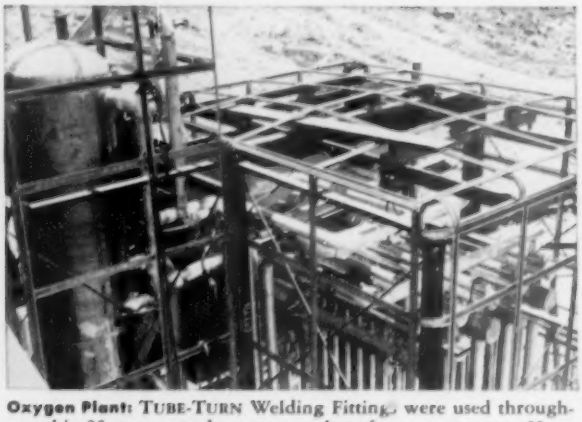
ALUMINUM PIPING

TUBE TURNS' ENGINEERING SERVICE

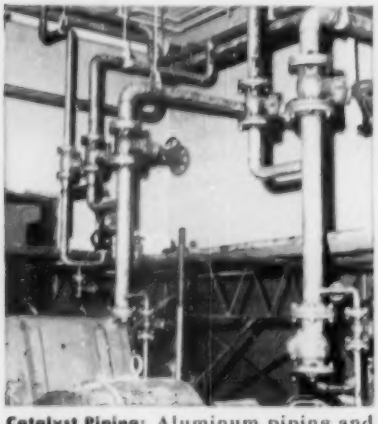
helps you apply aluminum piping on jobs like these...



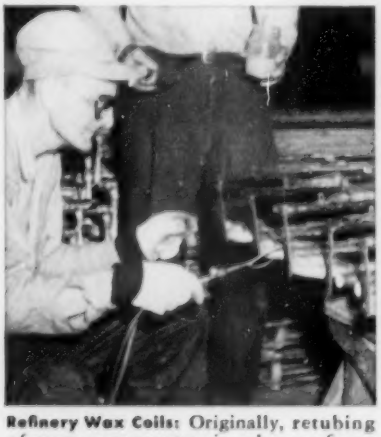
Oleic Acid Storage: Here, 2" aluminum lines carry oleic acid in this installation for a rubber company. TUBE-TURN Aluminum Welding Fittings are used for directional changes. Insert shows a compact combination of these fittings at a pump . . . an elbow, tee, reducer and flange.



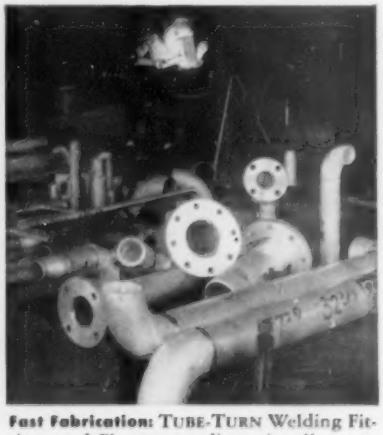
Oxygen Plant: TUBE-TURN Welding Fittings were used throughout this 25 tons-per-day oxygen plant for ore recovery. Here, operating temperatures range from 100°F to -320°F. Picture above shows reversing heat exchangers and fractionating tower prior to being enclosed in insulating shell.



Catalyst Piping: Aluminum piping and fittings were specified for certain services in this new TCR bead catalyst plant to prevent contamination of the catalyst. TUBE-TURN Welding Fittings and Flanges were employed in all aluminum lines from 1" to 10". Result: Lines are permanently leak-proof – maintenance is minimized.



Refinery Wax Coils: Originally, retubing of seven wax sweaters in a large refinery called for coils of another metal. Switch to aluminum piping and TUBE-TURN Welding Fittings saved $50,000 in material costs! Each unit required 900 TUBE-TURN 180° Welding Returns of 1" OD.



Fast Fabrication: TUBE-TURN Welding Fittings and Flanges are dimensionally accurate. Rigid inspection by Tube Turns assures true circularity and uniform wall thickness. Result: Alignment is perfect; fabrication is faster; installation simplified.

NEW BOOKLET – This new Tube Turns' catalog gives helpful information on aluminum pipe, fitting and flange materials. Mail the coupon for your free copy.

TUBE TURNS, Dept. J-4
224 East Broadway, Louisville 1, Kentucky

Please send free copy of new catalog on Aluminum Fittings and Flanges.

Company Name _____

Company Address _____

City _____ *Zone* ____ *State* _____

Your Name _____

Position _____

Available from your nearby TUBE TURNS' distributor

DISTRICT OFFICES:

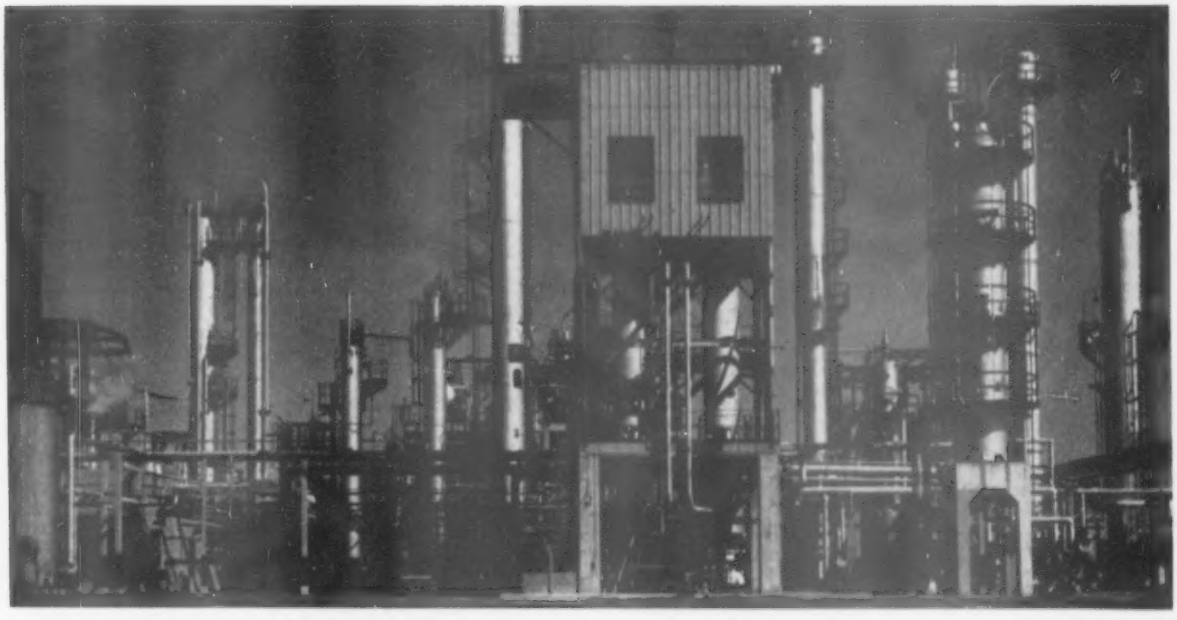
New York	Los Angeles
Philadelphia	San Francisco
Pittsburgh	Seattle
Cleveland	Atlanta
Detroit	Tulsa
Chicago	Houston
Kansas City	Dallas
Denver	Midland, Texas

*"TUBE-TURN" and "⊞" Reg. U. S. Pat. Off.

TUBE TURNS

A DIVISION OF NATIONAL CYLINDER GAS COMPANY

LOUISVILLE 1, KENTUCKY



CAT POLY AND CUMENE UNITS at British American's Montreal East refinery. Reactors in foreground. Cumene goes to B.A.-Shawinigan plant for manufacture of phenol.

$300 million investment means . . .

Petrochemicals Are on the March in Canada

CANADA—Where Oil Is King

A second round of expansion, following original post-war building of petrochemical facilities, is now getting into swing. Activity is heavy in ammonia, expansion of hydrocarbon raw materials recovery, polyethylene, and in sulfur recovery. Other organic-chemical-derivatives facilities are being expanded.

by John C. Reidel
Petrochemical Editor

THERE is a lot of activity in Canada's petrochemical industry. Estimated investment in this industry is well over $300,000,000. This is relative to a total $1,000,000,000 investment in the Canadian chemical industry.

British American-Shawinigan is expanding phenol and acetone production.

. . . In polyethylene. Canadian Industries, Ltd., is considering expansion of the existing plant at Edmonton. Dow is planning a polyethylene plant, and expanding ethylene derivatives manufacture at Sarnia. Union Carbide Canada is including polyethylene resin manufacture as part of its large facilities for making ethylene derivatives now under construction at Montreal East, Que.

Imperial Oil Co. at Sarnia is expanding refinery raw-materials recovery and planning to go into intermediates in a large way.

Polymer Corp., the government-owned facility at Sarnia, is on the verge of expansion with a new $15,000,000 butadiene plant. Shell is expanding solvents manufacture at Montreal East, Que.

. . . In ammonia, Canadian Industries, Ltd., is constructing a 200-ton per day plant at Millhaven, Ont. This is designed to operate on fuel oil, using the Texaco partial oxidation process. The alternate raw material would be natural gas, if this proves economical when a natural-gas transmission line is built later on.

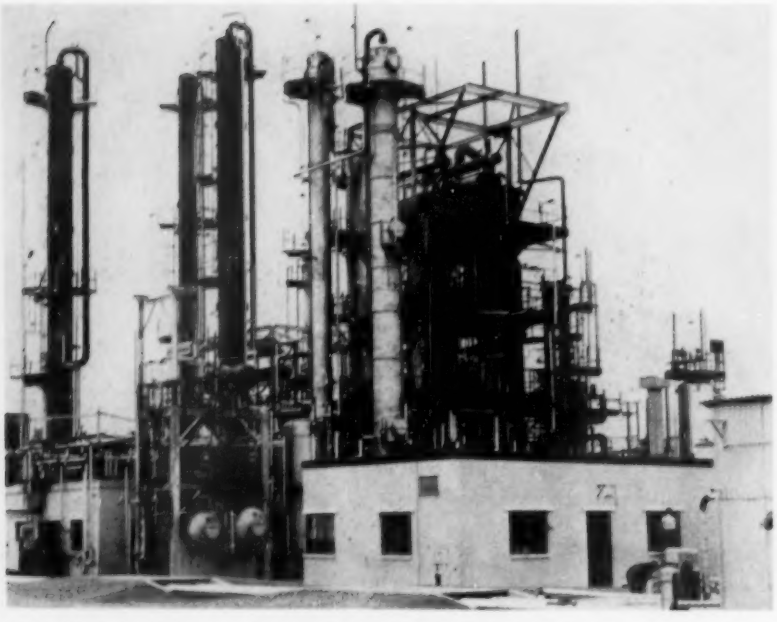
Consolidated Mining & Smelting Co. is planning expansion of its ammonia plant at Turner Siding, Alta. Northwest Nitro-Chemicals has a $22,000,000 ammonia plant under construction at Medicine Hat, Alta., to run on natural gas.

Quebec Ammonia Co., Ltd., is considering a plant at Verennes, Que., to run on fuel oil. Sherritt-Gordon Mines plan to double capacity of an existing ammonia plant at Fort Saskatchewan, Alta. Canadian Hydrocarbons, Ltd., is considering a $25,000,000 plant in the Winnipeg area for making high-analysis nitrogen fertilizers.

Canadian Oil Refineries, Ltd., at Sarnia is installing a $3,000,000 facility (Platformer-Udex) for making benzene, toluene, and xylenes.

. . . In sulfur. Further expansion in sulfur recovery is anticipated. At present Royalite and Shell Oil Co. are recovering elemental sulfur from sour natural gas. A large plant will be built at Montreal East to recover sulfur from refinery sour gas in this area. Work has begun on the new Pincher Creek sulfur-recovery plant which will operate on the Pincher Creek gas field controlled by British American Oil Co. Peace River gas will also be processed to recover sulfur under a contract between Pacific Petroleums, Ltd., and Jefferson Lake Sulfur Co.

Hydrocarbon plants . . . Announcement by Imperial Oil Co. that it would form



PART OF B.A.-SHAWINIGAN PETROCHEMICAL FACILITIES at Montreal East making phenol and acetone. A new expansion program now under way will boost capacity to 26,000,000 lb. of phenol and 16,000,000 lb. per year of acetone.

a new department to handle raw materials for petrochemical manufacture and also engage in manufacture and sale of alcohols, specialty solvents, detergent bases, and lube-oil additives, came in late 1955. This reflects the trend in the United States for oil companies to construct light-hydrocarbon recovery plants for sale of petrochemical raw materials or processing of intermediates internally. In mid-1956, Imperial announced a new $25,000,000 expansion for manufacture of ethylene, propylene, butylenes, butadienes, aromatic distillates, and tars.

Canada's expanding oil and gas industry will continue to make available increasing amounts of raw materials for the manufacture of petrochemicals. Oil reserves are now close to 3,000,000,000 bbl. and refining facilities have been expanded 100 per cent in the last 5 years.

Construction of gas transmission lines from western Canada to the consuming areas of eastern Canada and the United States will make available large quantities of condensates, some of which will become petrochemical raw material.

The large Crown-owned Polymer Corp., producer of synthetic rubber, must decide soon on construction of a new butadiene plant. At present Polymer Corp. is importing some butadiene.

An expanding phenol market is behind B.A.-Shawinigan's major expansion of phenol and acetone output. Added to earlier boosts in production, this latest expansion will double the original capacity (13,000,000 lb. of phenol and 8,000,000 lb. of acetone per year) of the Montreal East petrochemical plant.

Shell Oil Co. also is expanding Montreal East facilities to include manufacture of methyl ethyl ketone and sec.-butyl alcohol as well as dodecylbenzene alkylate detergents.

Dow Chemical at its diversified Sarnia facilities is well into a new $10,000,000 expansion program, including engineering of a polyethylene plant (perhaps a low-pressure process).

Possibly the largest, diversified facility under construction at present in Canada is the Union Carbide Canada Montreal East plant.

CANADA—Where Oil Is King

Survey of Canadian Petrochemical Plants

BRITISH AMERICAN OIL CO., LTD., Montreal, Que.
Raw materials: Propylene and benzene
Principal product: Cumene (to B.A.-Shawinigan)
Personnel: M. S. Beringer, president; J. A. McHardy, plant manager

B.A.-SHAWINIGAN, LTD. (British American Oil Co., and Shawinigan Chemical), Montreal, Que.
Raw material: Cumene
Principal products: Phenol, 13,000,000 lb. per year; acetone, 8,000,000 lb. per year; (byproducts—Acetophenone, mesityl oxide, and -methyl styrene, 1,000,000 lb. per year)
1956-57 Activities: Phenol and acetone production being expanded 50 per cent

BAKELITE (CANADA), LTD. (Carbide & Carbon Co. affiliate), Belleville, Ont.
Raw material: Methanol
Principal products: Formaldehyde (for phenol-formaldehyde and urea-formaldehyde plastics)
Personnel: F. Perry Wilson, president

CABOT CARBON CO. OF CANADA, LTD., Sarnia, Ont.
Raw material: Petroleum fractions
Principal products: Oil-type furnace black—over 55,000,000 lb. per year
Personnel: P. H. Delacour, executive vice president; W. F. Hendricks, resident manager

CANADIAN CHEMICAL CO., LTD. (Subsidiary of Celanese Chemical Corp.), Edmonton, Alta.
Raw materials: Butane and propane (refinery streams)
Principal products: Pentaerythrytol, methanol, propylene glycol, dipropylene glycol, n-propanol, n-propyl acetate, acetic acid, acetone, other alcohols, glycols, aldehydes, oxides, ketones, and cellulose acetates. Original plant cost (August 1953) reported at $70,000,000. Cellulose acetate capacity reported at 12,500 tons per year; pentaerythrytol at 8,500 tons per year.
Personnel: V. T. Anwyll, plant manager

CANADIAN GULF OIL CORP., Alberta (Pincher Creek gas field) work begun on sulfur recovery plant.

CANADIAN HYDROCARBONS, LTD., Winnipeg, Man.
Considering $25,000,000 plant in Winnipeg area for high analysis nitrogen fertilizers. (Winnipeg and Central Gas Co., subsidiary planning 80 tons per day ammonia and 600 tons per day nitrogen fertilizers).

CANADIAN INDUSTRIES, LTD., Edmonton, Alta.
Raw material: Ethylene (cracking ethane and propane from natural gas)
Principal products: Polyethylene
1956-57 Activities: Considering expansion of polyethylene facilities. (Originally cost $14,000,000—opened with capacity of 6,000 tons per year of polyethylene flake—since considerably enlarged).
Personnel: H. Greville Smith, president; S. T. Jones, plant manager.

CANADIAN INDUSTRIES, LTD., Millhaven, Ont.
Raw materials: Ethylene glycol and dimethylester of terephthalic acid.
Principal products: Plant makes synthetic polyester fiber and flake.
1956-57 Activities: Fuel oil (natural gas alternate if pipeline is built) to ammonia (200 tons per day)—under construction; partial oxidation process.
Personnel: H. M. Sherwood, plant manager.

IN ALBERTA

CANADA

The Industrial Development Branch of the Alberta Government can supply you with pertinent information on Alberta industries and industrial potentials.

Get accurate, detailed information on markets, factory sites, location of raw materials, transportation facilities, tax structures and other related subjects.

Individual surveys conducted for you on a confidential basis.

Maps, statistics and authoritative literature available on request.

The Government of the Province of Alberta functions to serve the best interests of individuals and businesses. Since both are mutually concerned in the development of the natural assets of the Province, business and government operate on the basis of the common responsibility shared by them.

To achieve this smooth co-operation, such legislation as is necessary is based on clear-headed thinking, good will, and equitable treatment to all. The Government of Alberta does NOT concern itself with state ownership of industry. It acts on the belief that the natural assets of the state should be open to individual enterprise and legitimate competition, subject of course, to public interest and the laws of the land.

There's a place for YOUR industry in Alberta. Write today for complete details. Address inquiries to:

RICHARD MARTLAND
Director, Industrial Development Branch,
Legislative Bldg.,
Edmonton, Alberta

GOVERNMENT of ALBERTA

DEPARTMENT OF MINES AND MINERALS

HON. E. C. MANNING
Minister

H. H. SOMERVILLE
Deputy Minister

CANADIAN OIL REFINERIES, LTD., Sarnia, Ont.
Raw material: Refinery streams.
Principal products: Hydrogen, methane, ethane, ethylene, propane-propylene, butane-butylenes.
1956-57 Activities: Raw material—cat reformate. Installing $3,000,000 Platformer-Udex facilities for chemically pure benzene, toluene and xylenes. Completion, August 1957. Platformer—4,400 bbl. per day; Udex—3,650 bbl. per day.
Personnel: V. M. Norwood, plant manager.

CARBIDE CHEMICALS CO., DIV. OF UNION CARBIDE CANADA, LTD., Montreal East, Que.
Bought Dominion Tar & Chemical Co., Montreal, Que., plant, which used refinery gases (ethane-ethylene) and whose principal products were: Ethylene oxide, ethylene glycol, higher glycols and detergents. This plant went on stream in 1953—cost $12,400,000. Capacity, 15,000 tons per year total glycols
1956-57 Activities: Raw materials—Refinery gases (from Imperial Oil and McColl-Frontenac); also cracking of liquid fractions.
Principal products: Ethylene (captive); ethylene oxide, ethylene glycols, polyethylene glycols, glycol ethers, ethanolamines, polyethylene. Plant to be fully integrated in 1957.
Personnel: G. D. Garrett, Jr., president. H. L. Reichart, Jr., vice president, production and engineering.

CONSOLIDATED MINING & SMELTING CO., Turner Siding, Calgary, Alta.
Raw materials: Natural gas.
Principal products: Ammonia (260 tons per day) and 200 tons per day ammonium nitrate.
1956-57 Activities: Planning increase in ammonia capacity to 390 tons per day; urea unit also planned.
Personnel: R. E. Stavert, president; R. S. Woodford, general superintendent.

DOW CHEMICAL CO. OF CANADA, LTD., Sarnia, Ont.
Raw materials: Refinery gases.
Principal products: Ethylene oxide, ethylene glycol, ethyl dichloride, carbon tetrachloride, perchlorethylene, trichlorethylene, styrene and polystyrene, diethylene glycol, triethylene glycol, dichlorethyl ether, styrene-butadiene latex. Original plant investment $35,000,000 beyond 1953.
Raw materials: Byproduct hydrogen from Sun refinery and Dow ethylene operation.
Principal products: Ammonia, over 100 tons per day. Some hydrogen comes from Sun Oil Co. Sarnia refinery catformer.
1956-57 Activities: Making 100 per cent expansion in ethylene capacity; constructing ethanolamine and pentachlorphenol plants; planning polyethylene plant.

DU PONT CO. OF CANADA, LTD., Maitland, Ont.
Raw material: Petroleum fraction.
Principal product: Adipic acid and hexamethylene diamine (nylon intermediates).
1956-57 Activities: Du Pont is starting manufacturing of fluorinated hydrocarbons. Acrylic fiber plant being built at cost of $8,000,000.

ETHYL CORP. OF CANADA, Sarnia, Ont.
Raw materials: Ethyl chloride (imported from U. S.).
Principal products: Tetraethyl lead. $12-15,000,000 plant being completed.

IMPERIAL OIL, LTD., Sarnia, Ont.
Raw materials: Refinery gases.
Principal products: Methane, ethane-ethylene, propane-propylene, butylene. Refinery gases (ethane-ethylene) to new Union Carbide Canada plant.
1956-57 Activities: New $25,000,000 expansion in recovery of ethylene propylenes and butylenes, butadiene, aromatic distillates and tars.
Personnel: J. R. White, president; G. R. McMillin, manager.

INLAND CHEMICALS OF CANADA, LTD., Fort Saskatchewan, Alta.
Reported to be in planning stage, 100 tons per day sulfur recovery plant.
Personnel: G. S. Grant, plant manager.

JEFFERSON LAKE SULFUR CO. (Subsidiary company formed with Pacific Petroleum, Ltd., for sulfur recovery plant operating on Peace River gas.)

LUBRIZOL OF CANADA, LTD., Niagara Falls, Ont.
Raw materials: Petroleum fractions.
Principal products: Lube-oil additives.
Personnel: M. A. Payne, manager.

McCOLL-FRONTENAC OIL CO., Montreal East, Que.
Raw materials: Refinery gases.
Principal products: Ethylene to new Union Carbide Canada plant.
Personnel: T. C. Twyman, president; H. M. Bolitho, superintendent.

MONSANTO CANADA, LTD., Montreal, Que.
Raw materials: Styrene.
Principal products: Polystyrene.

NORTHWEST NITRO-CHEMICALS, LTD., Medicine Hat, Alta.
Raw material: Natural gas.
Principal products: Under construction: $22,000,000 plant. Ammonia, high-analysis nitrogen and phosphate fertilizers.
Personnel: J. Albert Woods, chairman of board; C. W. Hancock, general manager.

PETRO-CHEMSOL CHEMICALS, LTD., Petrolia, Ont.
Raw materials—cat reformate.
Principal products: Benzene, toluene, xylenes. (This was formerly S. Nord Chemical Co. with original capacity of 3,000 bbl. per day of aromatics.)

POLYMER CORP., Sarnia, Ont.
Raw materials: Refinery streams.
Principal products: Styrene monomer, butadiene rubbers and butyl rubbers, ethylene, isobutylene. Approximate investment reported at $69,300,000. Some 100,000 long tons of all types of rubbers produced in 1955.
1956-57 Activities: Expansion being considered—new $15,000,000 butadiene plant.
Personnel: J. D. Barrington, president; L. D. Dougan, plant manager.

QUEBEC AMMONIA CO., LTD., Varennes, Que.
Raw materials: Fuel oil.
Principal products: Ammonia (125-ton per day plant under consideration with investment reported at $8,500,000).

ROYALITE OIL CO., Turner Valley, Alta.
Raw materials: H_2S from natural gas.
Principal products: Sulfur, 40 tons per day.
Personnel: C. Hay, president; A. McRea, plant superintendent.

ST. MAURICE CHEMICALS, LTD., Varenne, Que. (Shawinigan Chemicals Co. and Hyden Chemical Corp.)
Raw materials: Methanol and acetaldehyde.
Principal products: Formaldehyde and pentaerythritol.
Personnel: H. A. Norton, plant manager.

SHELL OIL CO. OF CANADA, LTD., Jumping Pound, Alta.
Raw material: Sour natural gas.
Principal products: Sulfur—reported capacity 80 tons per day. (Plant enlarged).
Personnel: W. M. V. Ash, president; T. B. Smith, plant superintendent.

SHELL OIL CO. OF CANADA, LTD., Montreal East, Que.
Raw materials: Propane-propylene.
Principal products: Isopropyl alcohol—6,000 tons per year design capacity; acetone—4,000 tons per year design capacity.
1956-57 Activities: Additional facilities being built to make methyl ethyl ketone and sec. butyl alcohol—capacity sufficient for Canadian requirements. Completion late 1956; dodecylbenzene detergent alkylate—completion mid-1957.
Personnel: J. Nichol, chemical plant superintendent.

SHERRITT-GORDON MINES, Fort Saskatchewan, Alta.
Raw materials: Natural gas.
Principal products: Ammonia (75 tons per day); ammonium sulfate (70,000 tons per year).
1956-57 Activities: Plan to double capacity.
Personnel: Eldon L. Brown, president; William H. Young, manager chemical metal division.

SUN OIL CO., LTD., Sarnia, Ont.
Raw materials: Refinery streams.
Principal products: Butylenes; cat reformer hydrogen to Dow.
Personnel: Gordon R. Henderson, manager.

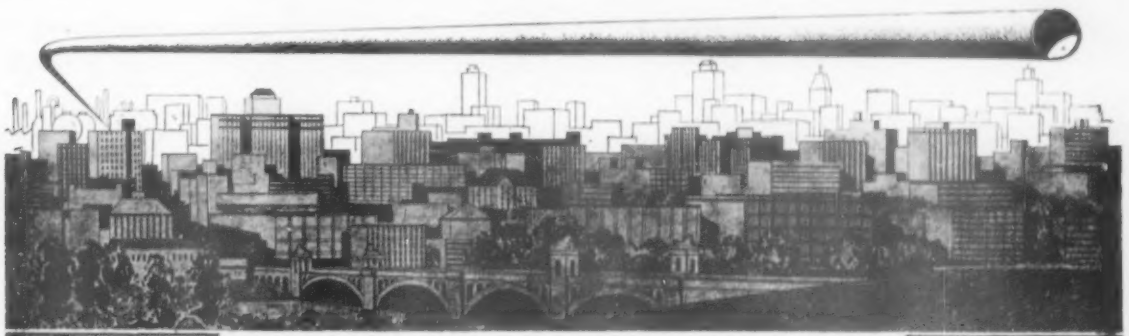
SURPASS PETROCHEMICALS, LTD., Scarborough, Ont.
Raw materials: Petroleum fractions.
Principal products: Rust preventive oils, lubrication oil additives.
Personnel: James E. Shields, president; Robert Forrester Cairns, technical director.

VOSCO INDUSTRIAL CHEMICAL PRODUCTS, LTD., Montreal, Que.
Raw materials: Petroleum fractions.
Principal products: Dodecyl benzene and higher alcohols converted to synthetic detergents.

Note: A large plant will be built at Montreal East to recover sulfur from refinery sour gas in this area.

CALGARY...

A NEW PIPELINE - A NEW SKYLINE!



For rapid industrial growth look to Calgary, Alberta . . . one of the youngest big cities in the world! Big and growing bigger, for Calgary—financial centre of the West—is on the verge of a new industrial boom!

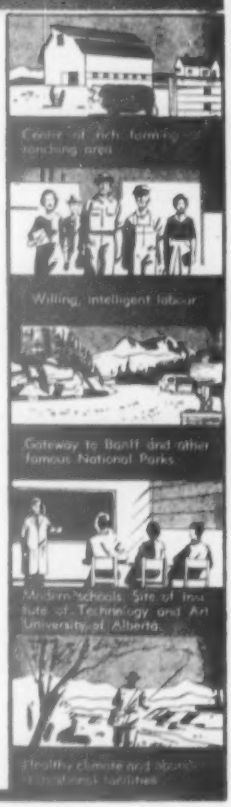
Work will soon begin on the Cremona pipeline. This $2,750,000 project means new skyline changes . . . wrought by a direct link for Calgary area refineries with the oil producing fields of Sundre, Westward Ho, Harmattan.

Calgary is also the centre of new natural gas discoveries —resulting in availability of by-products which stimulate industrial development.

Assured sources of oil and gas mean new opportunities for a diversity of enterprise. Investigate the ideal sites available . . . the low rates for natural gas and power . . . the many other reasons why your western plant will prosper in Calgary, Alberta!

New Industrial Booklet gives specific data on Calgary's large planned industrial development areas. Write NOW to the Coordinator of Industrial Development, City Hall, Calgary, Alberta.

CALGARY - CITY OF INDUSTRIAL GROWTH



EVERYBODY'S TALKING ABOUT *Edmonton* CANADA

- Centre of Canada's multi-million dollar oil, natural gas and petro-chemical industries.
- Sound economy based on established agricultural industry and diversified manufacturing.
- Established marketing and distributing centre—hub of vital rail, air and highway communications.

Address Inquiries to:
The Industrial Director
THE CITY OF EDMONTON
Civic Block
EDMONTON, ALBERTA

THE CITY OF EDMONTON
Edmonton Canada

PIPE DREAMS?

ORES DIRECT FROM ORIGIN TO OUTLET!

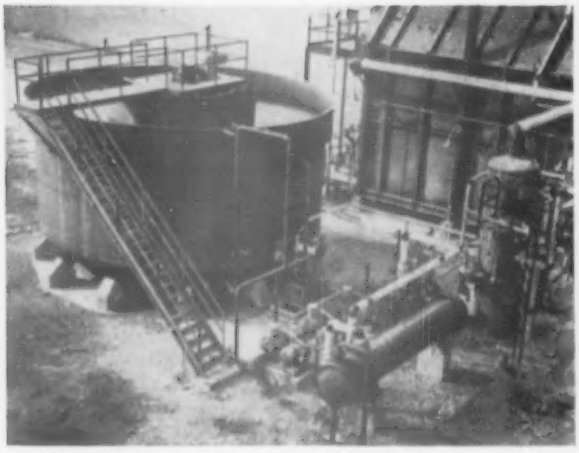
They're streamlining industry with pipelining. An endless variety of products will be transported via pipeline in the "Freight of the Future" movements. When that day comes, MAJESTIC CONTRACTORS LIMITED will turn dreams into reality with years-ahead planning. Skillful fabrication based on down-to-earth economy brings end results styled to meet your requirements.

THE BIG 'M' MEN·MONEY·MACHINERY

majestic CONTRACTORS LTD.

PIPELINE CONSTRUCTION, ENGINEERING SURVEY, AERIAL PHOTOGRAPHY
HEAD OFFICE: ROYAL TRUST BUILDING, EDMONTON, ALBERTA
BRANCHES: VANCOUVER, REGINA AND TORONTO

PHENOLIC-WATER TREATMENT, Imperial Oil, Ltd., at Sarnia. Activated sludge on left, trickling filter on right, and oil-water separators in background.



PHENOLIC-WATER TREATMENT, Canadian Oil Refineries, Ltd., Sarnia. Sulfide stripper on right and activated-sludge tank at left.

It's 99.9 per cent efficient

Biological Oxidation of Phenolic Waste Water

by Alex D. McRae, William K. Ross, and Alan A. Sheppard

BIOLOGICAL oxidation is a comparatively cheap method of destroying low concentrations of phenols in aqueous solutions when compared with chemical processes or incineration. There are proprietary plants on the market and it has been demonstrated that phenol destruction can be accomplished at better than 99.9 per cent efficiency.

Sudden changes in feed composition are detrimental and, for this reason, holding tanks of up to 4 days residence time are essential to provide a uniform feed and to protect against upsets. Small oil separators have been added to aerate feed and to remove oil.

Careful training of plant operators is very important, and after the initial startup, these plants will operate with very little attention, providing that the ground rules are obeyed and that a break-in time for the bacteria is allowed.

Plant Experience—Imperial

The major sources of phenolics which are fed to the biological-oxidation plant and their contributions are as follows:

Source—	Flow bbl. per hour	Average concentration p.p.m.	Lb. per day
Phenol plant	60	100	50
Cat-cracker sour water	50	600	265
Treating-plant wash water	75	400	250

Process equipment . . . The plant consists of a 30-ft.-diameter trickling filter and an activated-sludge tank 50 ft. in diameter (see Fig. 1). A flue-gas stripping tower was provided to preheat the feed originating from sour-water streams and wash water from caustic-treating units.

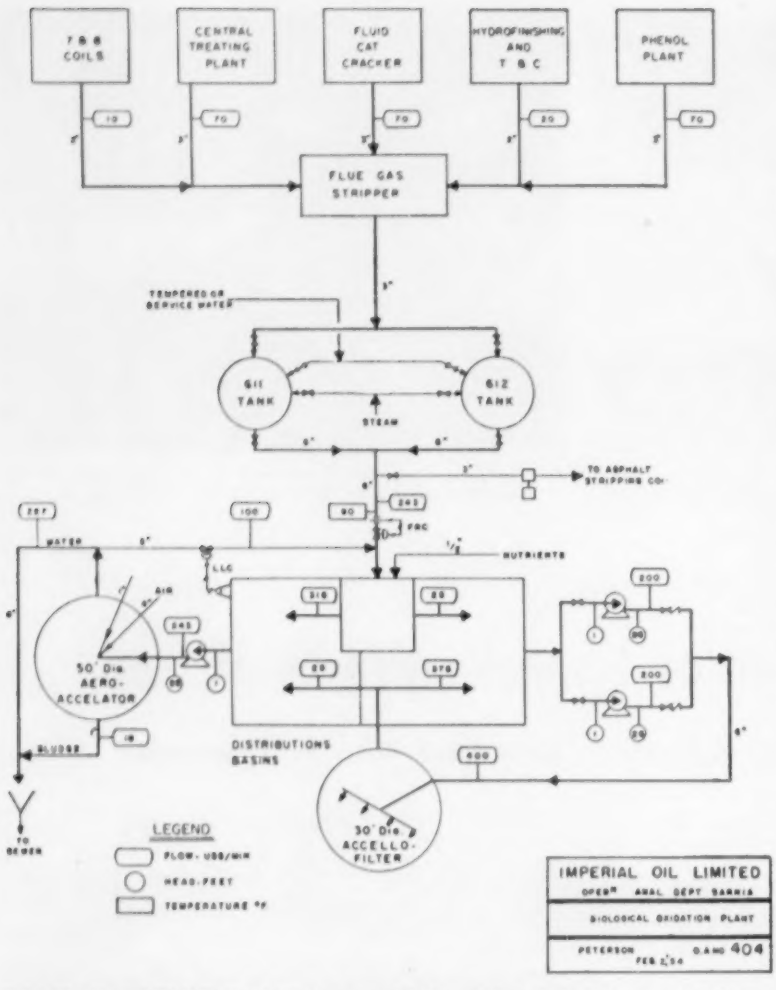
The trickling filter is composed of a steel shell 30 ft. in diameter and 8 ft. high. It is filled to a depth of 6 ft. with blast-furnace slag (2 to 4-in. mesh). The feed is pumped from a sump through two pairs of rotary-distributor arms which spread it evenly over the surface of the slag. The water percolates through the slag and flows back to the sump by means of a return trench. The filter was designed to serve as a breeding ground for the bacteria and as a constant source for supply of fresh organisms to the activated-sludge tank. A 6:1 recycle ratio is maintained on the feed.

The major part of the phenol oxidation takes place in this tank. It is equipped with a turbomixer, consisting of an 18-ft. shaft with vertical blades on the bottom. This mixer circulates sludge within the tank and disperses the air supply in fine bubbles in the water. High oxygen-transfer efficien-

TABLE 1—JANUARY 1956-FEBRUARY 1956 ACTIVATED-SLUDGE PLANTS, SARNIA, ONT., CANADA

	Plant effluent			Plant effluent			Per cent removal average
	Max.	Min.	Average	Max.	Min.	Average	
Sun Oil Co.							
Flow, gal. per min.	250	150	200	250	150	200	
Flow, pH	9.2	8.2	8.7	8.1	6.7	7.5	
Sulfides, p.p.m.	65	2	18	0	0	0	100
Sulfides, lb. per day	156	5	43	0	0	0	
Phenols, p.p.m.	98	25	54	4.5	0.4	1.9	
Phenols, lb. per day	235	60	130	11	1	4.5	96.5
Imperial Oil, Ltd.							
Flow, gal. per min.	172	35	140	172	35	140	
Flow, pH	10.5	7.3	8.5	8.5	6.8	7.3	
Sulfides, p.p.m.	80	20	40	0	0	0	
Sulfides, lb. per day	165	41	82	0	0	0	100
Phenols, p.p.m.	400	30	180	0.8	0.25	0.4	99
Phenols, lb. per day	825	62	370	1.6	0.05	0.8	

CANADA—Where Oil Is King



BIOLOGICAL-OXIDATION PLANT of Imperial Oil, which is designed to treat 350 bbl. of fresh feed at a concentration of approximately 380 p.p.m. Fig. 1.

cies are claimed for this type of mechanical mixer.[8] Three compressors, 2 of which are at fixed speed and 1 at variable speed, deliver a total of 960 cu. ft. per minute at 6 lb. of pressure. The air enters below the rotor blades of the turbomixer.

The flue-gas-stripper tower is 3½ ft. in diameter with 10 standard bubble trays. Steam and flue gas are used to neutralize, deodorize, and reduce the phenol content of sour water, treating-plant wash water, and phenolic water of other sources.

Design conditions . . . The biological-oxidation plant was designed to treat 350 bbl. per hour of fresh feed at a concentration of approximately 380 p.p.m., which is equivalent to 800 lb. of phenol per day. It was assumed that at least 90 per cent of the phenol would be destroyed. The feed tanks were provided with swing suctions to remove any free oil.

A maximum specification of 50 p.p.m. of sulfides was set on the feed. The temperature of the trickling filter and activated-sludge tank was maintained between 90° and 100° F.

Unit operation . . . Batches of bacteria were bred in 45-gal. drums in the laboratory and this source was used to start a culture in the sump of the trickling filter. However, after a few days the coating on the stones was not as abundant as expected. To augment the growth of sludge, two tank trucks of sludge were obtained from the waste-treatment plant of Dow Chemical Co., Midland, Mich.

Two weeks were required for these bacteria to become accustomed to the refinery wastes. During the past 2 years the unit has been seeded successfully with sludge from an activated-sewage plant at London, Ont. This material adapted very readily to the refinery phenols. The plant can be brought back to operation in a few days and it takes a week to reach full capacity.

CANADA—Where Oil Is King

After starting the plant in April 1954, it was discovered that some factor was interfering with the successful operation of the unit. Runs of up to 2 weeks were obtained, but the bacteria bulked and were lost to the sewer. When satisfactory operations took place, at least 500 lb. per day of phenol was oxidized with the removal of over 99 per cent.

This was certainly encouraging and a group was formed to study the operation of the plant in order to solve the difficulties. Laboratory investigation and pilot studies indicated that variables in the feed were affecting the operation. These included pH, a sulfide level of over 50 p.p.m., the presence of free oil, and an excessive oxygen demand in the feed.

Feed preparation . . . Initially spent-caustic and sour-condensate waters were neutralized in the flue-gas tower. Although the results showed that a marked reduction in pH, sulfide, and phenol was possible, the chemical-oxygen demand of the neutralized caustic was still excessive for biological treatment.

The spent caustic was removed from the tower and an incinerator built to

THE AUTHORS

A. D. McRAE

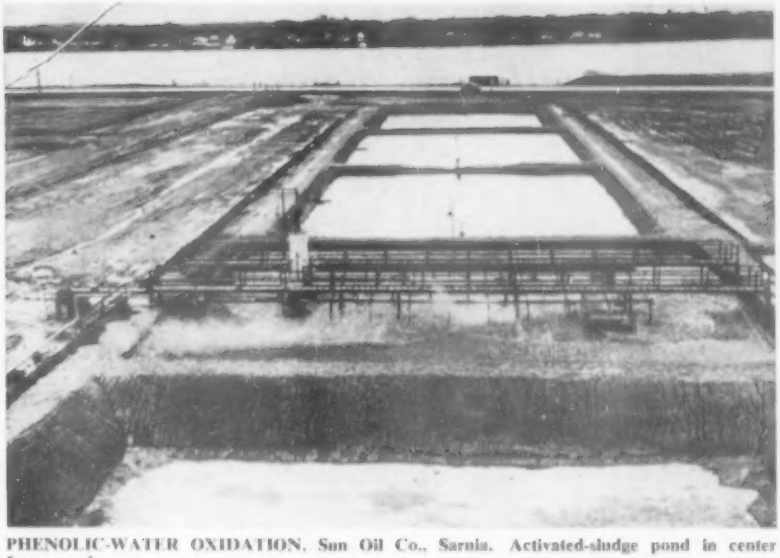
Alex D. McRae is oil-loss and waste controller in the engineering division, manufacturing department, Imperial Oil, Ltd., Sarnia, Ontario. A graduate of the University of Western Ontario, he has served 9 years with International Petroleum Co., Ltd., in Peru, and a total of 20 years with Imperial. Alan A. Sheppard is senior chemist in charge of analytical and pollution-control laboratories at Imperial's Sarnia refinery. He

A. A. SHEPPARD

W. K. ROSS

joined Imperial in 1943, after graduation from Toronto University.

William K. Ross is control section supervisor, in charge of the treating and pollution section of Imperial's Sarnia operations analysis department. He has been with Imperial since his graduation from McGill University in 1947. McRae originally presented this paper at the A.P.I. midyear refining meeting, Montreal.



PHENOLIC-WATER OXIDATION. Sun Oil Co., Sarnia. Activated-sludge pond in center foreground.

burn this material. In place of the caustic, wash water from caustic treating was fed to the tower. This operation started on December 4, 1954, and, since that time, the quality of the feed to the biological-oxidation plant has been more consistent, with the following improvements accomplished:

1. The oxygen demand of the feed per pound of phenol dropped from several times the stoichiometric ratio of 2.4 lb. to approximately the correct level.

2. The hydroxide alkalinity was reduced from 300 p.p.m. to nil.

3. The pH of the feed dropped from 11 to 9.

4. Sulfide content of the feed rarely exceeded 50 p.p.m. It was felt that the peaks of over 100 p.p.m. were contributing to operating difficulties.

5. Up to 150 lb. of phenol were distilled overhead in the neutralizer tower and burnt in an adjacent process furnace. This decreased the load on the biological-oxidation plant.

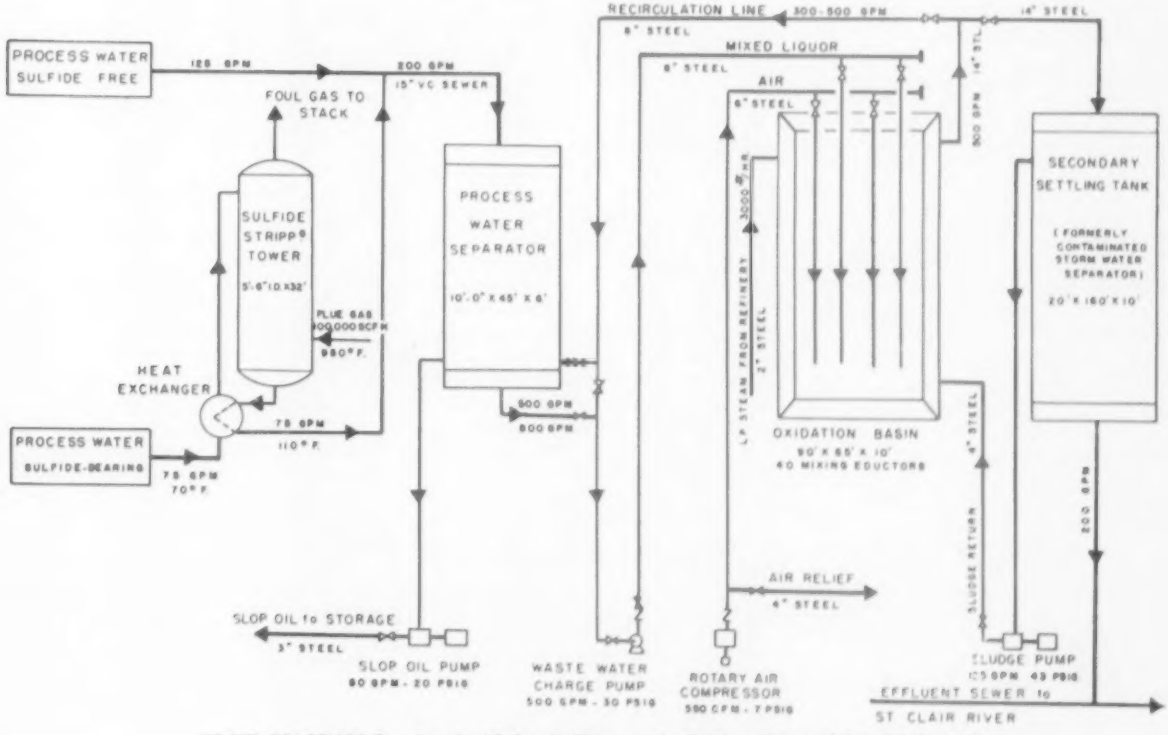
CANADA—Where Oil Is King

Activated-sludge tank . . . Since December 1954, with the exception of mechanical difficulties, a steady improvement in the operation of this unit was accomplished. The feed rate increased to 600 lb. per day, with an efficiency of 99.5 per cent removal despite wide variations in phenol concentration.

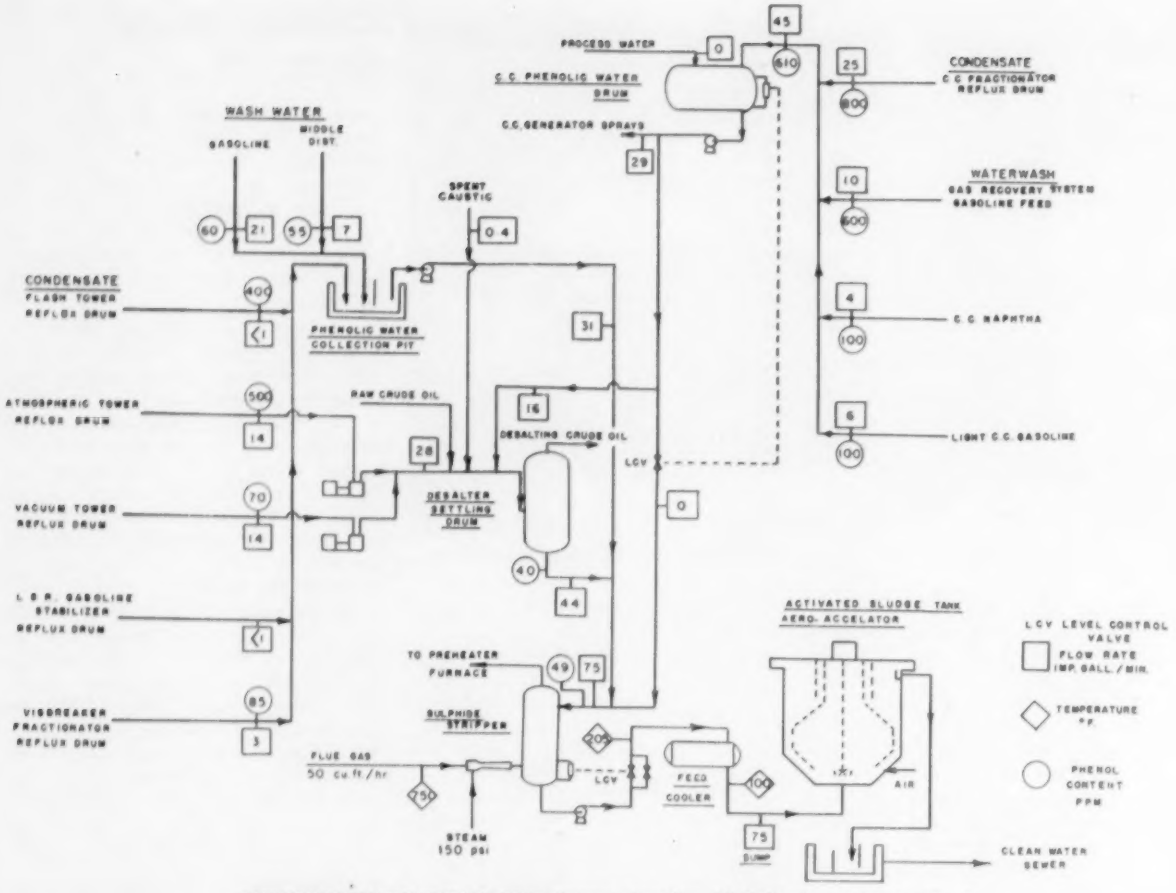
Foaming was a difficulty during the first few months. Proprietary antifoam compounds having only a temporary effect were used, but the efficiency in aeration was reduced. Mechanical foam-breaker arms were attached to the shaft of the turbomixer about 1 ft. above the surface of the liquid in the central draft tube, and the inner draft-tube wall was extended upward for a distance of 5 ft. in order to retain the foam.

The capacity of the plant is limited by the rate at which oxygen can be dissolved in the water. To increase the capacity, the turbomixer blades were enlarged and baffles were installed at the base of the tank. Thirty-six 1½-in. eductors were installed in the bottom of the central draft tube as a standby in case of mechanical failure. Present efficiency of oxygen solution is about 15 per cent.

Trickling filter . . . Flooding of the



FLOW DIAGRAM for phenol-oxidation facilities, at the Sarnia refinery of Sun Oil Co. Fig. 2.



PHENOLIC-WATER-TREATMENT diagram, Canadian Oil Refineries, at Sarnia. Fig. 3.

CANADA—Where Oil Is King

trickling filter was experienced. It was found that this could be eliminated by shocking the bacteria with a high concentration of phenol and washing off the excess with a fire hose. This effect was temporary, however, and new baffles were installed to ensure that any sludge from the filter would be pumped into the activated-sludge tank, rather than being recycled in the filter.

The trickling filter has not performed as well as expected, although a certain amount of slime has continually dislodged from the stones. There is not enough bacteria produced to supply the activated-sludge tank when the plant is in difficulties. The trickling filter destroys less than 10 per cent of the total amount of phenols, and it is recommended that in future installations the trickling filter be eliminated. An alternate source of activated sludge from a sewage-disposal plant should be available for starting up a plant of this type.

Cost of biological oxidation . . . The costs of biological oxidation for the first 9 months of operation, compared with the estimated costs of other processes, are shown in Table 1.

These costs were determined on an assumption of 800 lb. per day of phenols. Since the cost of incinerating a pound of phenol is inversely proportional to the concentration and varies widely with fuel costs, this comparison is not valid except for the Sarnia refinery The cost of chlorination and biological oxidation is much lower for those streams which do not require stripping.

The cost of stripping is based on the cost of live steam. This could be reduced considerably by using flue gas only or surplus exhaust steam. The cost data for biological oxidation were somewhat high as a result of startup expenses and alterations of equipment. At present this cost is much lower because of higher throughputs and better operation.

Plant Experience

Sun Oil Co. started a biological-oxidation plant for treatment of refinery waste waters at its Sarnia plant in 1953. Complete segregation of waste waters was built into the sewage system during construction of the refinery in 1952. Independent systems were built for process waste water, contaminated storm drainage, cooling water, uncontaminated storm drainage, and sanitary sewage. A sixth system for sulfide-bearing process waters has recently been added. See Fig. 2.

The process wastes, contaminated storm waters, and spent cooling waters are each provided with individual oil-water separators of A.P.I. design.

The process sewer system carries the main oxygen-consuming contaminants in the refinery, averages about 300,000 gal. per day, and contains over 95 per cent of phenols, sulfides, mercaptans, and other water-soluble pollutants. It was anticipated that these waters would require secondary treatment and their segregation was considered a practicable step.

When the activated-sludge plant was built, oxidation of phenolic compounds represented the principal goal. Construction of the bio-oxidation unit was expedited by the use of the process sewer and separator system and by using other existing equipment and piping.

Separable oil and solids are first removed in the separator and the effluent is then pumped to an aeration basin, 90 by 65 by 10 ft., surfaced with 2 in of cement grout. The feed and recycle enter the bottom of the basin through 40 eductors.

A rotary blower supplies air to the eductors at 500 cu. ft. per minute and 7 psig. The overflow from the basin flows through a 14-in. flume to a rectangular separator which serves as a sludge-collecting unit. A positive-displacement pump returns the sludge to the aeration basin at 125 gal. per minute. Clarified effluent flows from the separator to the main discharge sewer. A system for recirculating this effluent has been provided.

Sulfide-stripping tower . . . In 1955, a sulfide-stripping tower was built to remove sulfides and mercaptans and to increase the temperature of the feed to the aeration basin. The tower, 5 ft. 6 in. in diameter and 32 ft. high, uses 100,000 std. cu. ft. per hour of 950-F flue gas from the regenerator stack of a catalytic cracking unit. Ninety-five per cent of the sulfides are removed from 75 gal. per minute of feed. The water is sprayed through nozzles at the top of the tower and it comes in intimate contact with the flue gas at minimum pressure drop.

Initial operations . . . Two loads of bacterial sludge were obtained from Dow Chemical Co. at Midland, Mich., for initial seeding. Biological oxidation of phenol began within the first few hours.

Two years experience: An average concentration of 130 lb. per day of phenolics was oxidized successfully with daily peaks of 200 lb. without loss of efficiency. Mechanical difficulties and variations in feed quality interfered with continuous efficiency during the first year. High alkalinity and sulfide concentrations have been eliminated by the sulfide-stripping tower. Ideal conditions include a temperature range of 70° to 85° F., a sludge-volume index of 4 to 6 per cent and a pH of 6.0 to 9.0.

The plant will handle loads of 150-p.p.m. oil, 200-p.p.m. phenolics, and 50 p.p.m. of sulfides. An auxiliary direct-contact heater of 2.5 million B.t.u. per hour was installed to provide adequate warmth during winter months.

Operating expenses are lower than those quoted for Imperial Oil, Ltd.'s, initial period. A cost of 45 cents per pound of phenol removed is quoted for Sun Oil, which is approximately the present cost at Imperial's refinery.

Canadian Oil Refineries—Corunna

This refinery has just completed a 27-ft. diameter activated-sludge tank with a pretreatment flue-gas stripper for sulfides. (See Fig. 3.) The bio-oxidation unit will handle 75 gal. per minute containing 150 lb. (180 p.p.m.) of phenol per day. No operating data are available at present, but it is expected that no untoward difficulties will occur.

References

1. A. D. McRae, "The Phenol Waste Problem—Experience in Canada," paper presented to the Twentieth Annual Convention of the Canadian Inst. of Sewage and Sanitation, October 1953.

2. R. Y. Stanier, "Problems of Bacterial Oxidative Metabolism," Bacteriol. Revs. 14 179-91 (1950).

3. W. C. Evans, B. S. W. Smith, R. P. Linstead, and J. A. Elvidge, "Chemistry of the Oxidative Metabolism of Certain Aromatic Compounds by Microorganisms," Nature 168 772 (1951).

4. I. F. Harlow, T. J. Powers, and R. B. Ehlers, "Phenolic Waste Treatment Plant of Dow Chemical Co.," Sewage Works J. 10 1043 (1938).

5. G. E. Lynn and T. J. Powers, "Bacterial Studies in Oxidation of Phenolic Wastes," Sewage and Ind. Wastes 27 61 (1955).

6. R. H. Coe, "Bench-Scale Biological Oxidation of Refinery Wastes with Activated Sludge," Sewage and Ind. Wastes 24 (6) 731-49 (1952).

7. T. J. Powers, Dow Chemical Co., Midland, Mich., private communication.

8. A. Passveer, "Research on Activated Sludge—A Study of the Aeration of Water," Sewage and Ind. Waters 25 1253-8 (1953).

YEL⊖BAK ... *Industrial* THERMOMETERS

Flat Bore—Mercury Filled—Engraved Stem—with 18-8 stainless steel stems. Chromium-plated case to resist corrosion and dirt. These midget industrial thermometers are recommended for equipment requiring Small Armored thermometers . . . and where large industrial thermometers are inappropriate.

An economical instrument . . . because thermometers may be replaced "on the job" . . . that is—refill can be inserted into Armored Case without difficulty . . . eliminates necessity of sending instrument to factory for thermometer replacement. Assured Accuracy.

cenco

The most complete line of scientific instruments and laboratory supplies in the world.

R.S.C.

REFINERY SUPPLY COMPANY

621 EAST FOURTH STREET ● TULSA 3, OKLAHOMA
3315 McKINNEY AVENUE ● HOUSTON 3, TEXAS

CENTRAL SCIENTIFIC COMPANY
1700 IRVING PARK ROAD ● CHICAGO 13, ILLINOIS
CHICAGO NEWARK BOSTON WASHINGTON DETROIT SAN FRANCISCO
SANTA CLARA LOS ANGELES TORONTO MONTREAL VANCOUVER OTTAWA

Buildings in this Edmonston Gasoline Plant fabricated by ALLIED STEEL

ALLIED STEEL BUILDINGS IN CANADA

- Single or Multiple Span
- Custom Engineered
- Can be Furnished Insulated
- 100% Salvage

ALLIED STEEL Buildings are available in sectional or fabricated designs to meet your specific needs. Metal or asbestos wall and roof coverings. Steel buildings may be furnished with insulation. Get the best solution to your building problem . . . wire or write ALLIED.

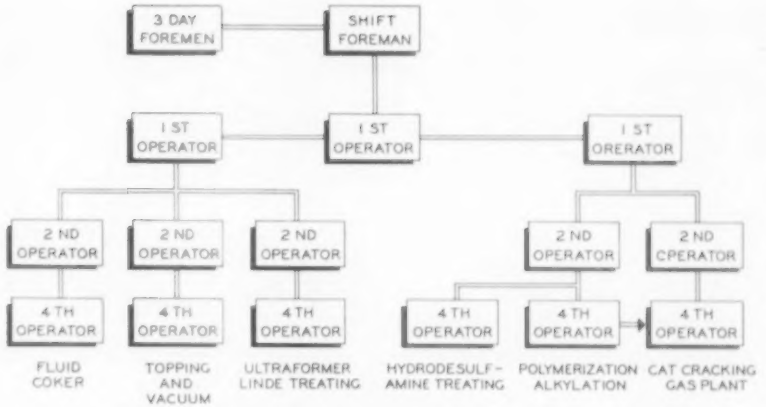
ALLIED STEEL PRODUCTS CORP.
2100 N. LEWIS TULSA, OKLAHOMA

ROYALITE....

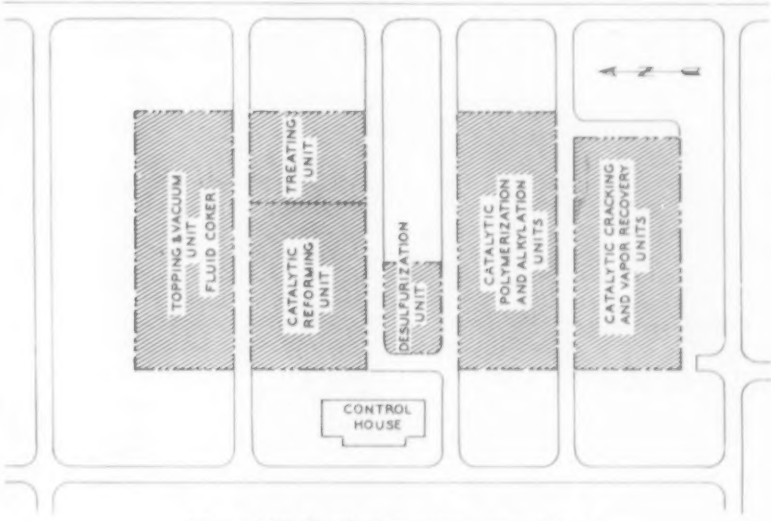
A fully integrated, independent Canadian Petroleum Company carrying out Exploration, Drilling, Refining, Pipeline Operations, and Marketing throughout Western Canada.

ROYALITE OIL COMPANY, LIMITED
ROYALITE BUILDING • CALGARY, ALBERTA

ROYALITE



FINAL ARRANGEMENT of the operating setup at the Petrofina refinery. Fig. 1.



UNIT PLOT PLAN of the process area. Fig. 2.

Petrofina Refinery Operates With Below-Average Expenses

by D. Ronald Hickey

THE several unique features of the Montreal refinery of Canadian Petrofina, Ltd., have commanded considerable attention in the petroleum refining industry. Among these are:

- The single control room.
- The high degree of integration between units.
- Complete color coding.

The plant has had the usual amount of difficulty in startup operations, since the first crude was charged in September 1955. However, good runs have been recorded on all units, and good yield information is now available. This is summarized in the accompanying tables.

The operations department of the 20,000-bbl. refinery is quite small. It takes only 14 operators per shift, including foremen, to run the plant. This is due to the highly centralized control system and the high degree of integration between units.

The author is process engineer, Canadian Petrofina, Ltd., Montreal.

CANADA—Where Oil Is King

Operating Setup

Embodied in the original conception and design of the Petrofina refinery was the philosophy of helping to maintain low running expenses by keeping the number of unit operators to a bare minimum. One of the innovations in this respect is centralized control. One control room houses the "boards" for all the process units. The room is 80 by 40 ft., and the linear length of panel (all of it graphic) is 150 ft.

Much thought was given by the plant management before tentative operating schemes were drawn up. After extensive rejection and revision, a chart was formulated, and the procurement of personnel was inaugurated. The main point of the hiring program was to obtain a very high percentage of highly qualified operators. The type of experience sought was the man who had worked on as many different plants as possible.

The original operating setup worked, but not as well as was desired. This was not unanticipated, the philosophy being to give it a good try, and modify only slowly and carefully.

Depicted in Fig. 1 is the final arrangement; it has proved most successful. (Study of the chart should be made in conjunction with Fig. 2, the unit-plot plan.) Reservation is held that revision inside the control room might be necessary when the fluid coker goes on stream.

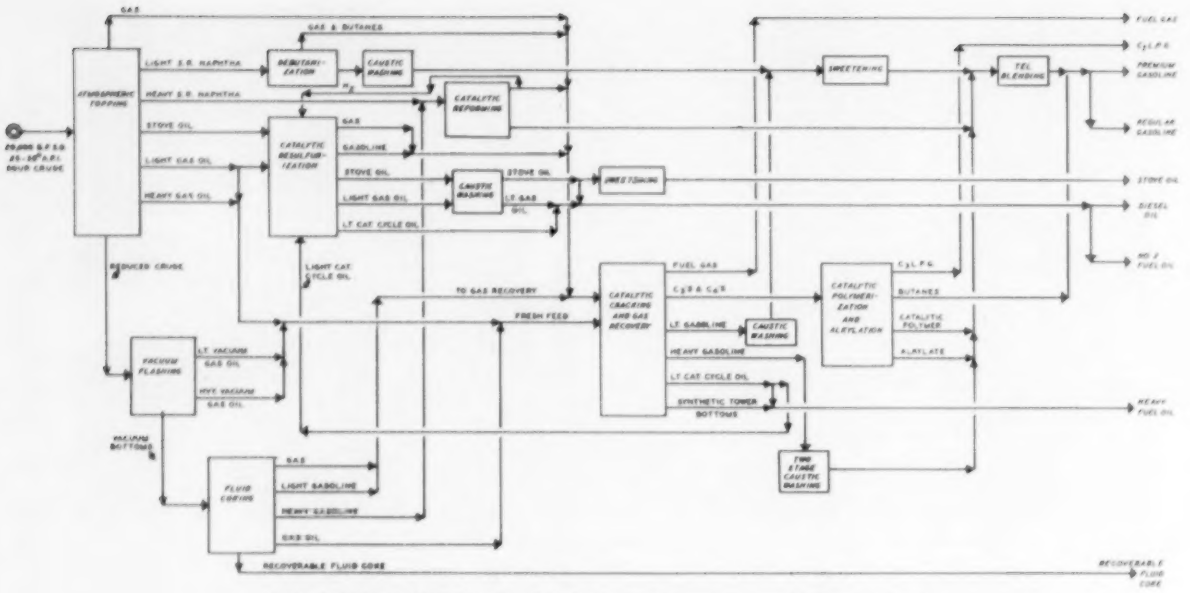
The day foremen are assigned one to the north area, one to the south area, and the third is a training foreman who assists at most unit startups and is a general trouble shooter.

There are three first operators, two are boardmen, and the third is a "rover" who directs himself to any part of the units, in the control room, or more often outside, where he is needed. Assigning the three most skilled men on a shift thus, has worked very well and is the key to successful operation of this plant.

The second operators are outside but do occasionally come inside in the course of their work. The fourth operators are always on the unit. As is indicated, the fourth on the alkylation unit occasionally helps out on the cat cracker.

In this way 14 men per shift operate the units of this plant. They, with the shift foreman, plus a pumper, two gagers, two boiler-house attendants, two instrument mechanics and a pipefitter are the 23 men that make it all go.

Operation started . . . In September 1955 the crude unit was commissioned



SCHEMATIC FLOW DIAGRAM of the catalytic refinery at Montreal. Fig. 3.

and subsequently the various other units were brought on stream. During the initial months of operation an inordinate amount of difficulty with equipment was encountered, and some process troubles further complicated matters. As yet, not all the bugs are out, but good runs have been made on all the units.

The yields presented are, in a sense, theoretical. They represent production for a fully integrated operation at the design crude charge rate of 20,000 bbl. per stream day. It is suggested that the figures be studied in conjunction with the refinery block flow diagram in Fig. 3 as well as the brief accompanying comments.

1. Crude topping and vacuum-flash unit . . . Yields are based on a throughput of 20,000 bbl. per stream day, the design rate, charging a mixture of crudes made up of 83 per cent Kuwait, and 17 per cent Iraq (Kirkuk). Kuwait is a sour crude, 2.86 per cent sulfur, 31.7° A.P.I. During the first winter of operation, most of the diesel (or light atmospheric gas oil) has been utilized as catalytic feed, along with the heavy and vacuum-gas oils.

The vacuum tar is being cut back with synthetic tower bottoms and light catalytic-cycle oil to make bunker fuel. However, this material will eventually form charge stock to the fluid coker.

2. H.C.C.U. and vapor recovery . . . The catalytic cracker is a Houdriflow moving bed type. Synthetic chrome-bead catalyst is employed because of high sulfur and trace metals content in the feed. In addition, this type of catalyst gives a favorable yield of isobutane for alkylation. Feed has been straightrun gas oil only so far.

Usually considered with catalytic cracker is the vapor-recovery unit where, as well as the cracked gases and gasoline, other refinery gas streams are processed. The fuel-gas yield shown represents only that from the Houdriflow itself. The absorber is operated to retain 80-82 per cent of propylene, while the combined C_3-C_4 stream forms the feed to the polymerization and alkylation units. The debutanized catalytic cracked gasoline is split into two fractions, while having its "tail" cut off in the "splitter," a single side-draw distillation column.

Light catalytic cycle oil is used as cutter stock, or desulfurized and

CATALYTIC CRACKING AND VAPOR RECOVERY

	B.P.S.D.	Design	Vol. %
Straightrun gas oils	8,940	9,900	100
Recycle	4,800	6,200	53.7
Total charged	13,740	16,100	
Gas (F.O.E.)	519		5.8
C_3-C_4	2,119		23.7
Light catalytic cracked gasoline	3,200		35.8
Heavy catalytic cracked gasoline	832		9.3
Light catalytic-cycle oil	2,038		22.8
Synthetic tower bottoms	599		6.7

CATALYTIC REFORMING

	B.P.S.D.	Vol. %	C.F.R.-1 clear	Plus 3.0 cc.
Naphtha feed	2,840	100	35-45	
1. Reformate	*2,593	91.3	*85.0	94.3
2. Reformate	2,420	85.2	90.0	97.8
3. Reformate	2,388	84.1	93.0	99.9
Hydrogen	†660-720			

*Corrected to 10 lb. R.v.p. †Standard cubic feet per barrel.

HYDRODESULFURIZATION

	B.P.S.D.	Vol. %	Wt. % S. in feed	% of S. removed
Charge*	3,000	100		
1. Stove oil	2,973	99.1	0.41	99.0
2. Light catalytic-cycle oil	2,967	98.9	1.66	98.5
3. Light catalytic-cycle oil	2,916	97.2	2.10	95.5

*815 psig. at 650°-670° F.

CANADA—Where Oil Is King

Greenshields & Co Inc

Underwriters and Dealers in Canadian Securities

Greenshields & Co

Members
Montreal and Toronto Stock Exchanges

MONTREAL TORONTO NEW YORK
QUEBEC OTTAWA SHERBROOKE

Oil Loans

THE 1ST NATIONAL BANK OF SHREVEPORT

LOUISIANA'S OLDEST BANK

ROBERT F. CASHEN — Manager Petroleum Department

CASE HISTORY Nº AM-V-0122

One of a series dealing with the performance of Paxman engines, in oilfields in America, Africa, Europe and Australasia.

Aboard barge G.P.5 on LAKE MARACAIBO

OWNERS & OPERATORS: Compania Shell de Venezuela Ltd., Maracaibo, Venezuela.

INSTALLATION: Three OWECO E.500 slush pumps. Two normally in use, with third in reserve) Power for slush pumps by four Paxman 12 RPH "Package" sets of 1,468 total s.h.p. Two Paxman 12 RPH engines drive 250 kVA alternators to supply power and light.

PERFORMANCE: Barge G.P. 5 commenced full operation on June 3rd. 1955 and since then a number of wells have been completed. Reports received indicate that the Paxman engines have performed well and have given every satisfaction.

* *Other areas where Paxman drilling engines are in service.*

Any drilling superintendent will tell you good progress in the hole largely depends on availability of ample, dependable power for driving draw-works, rotary table and slush pumps. Paxman units are being chosen by an increasing number of oil companies and drilling contractors, for their rugged power and dependability.

Look what you get when you specify Paxman:—

1 **WELL-TRIED DESIGN**
Paxman Vee-form engines have been continuously developed since 1937 to their present state of efficiency and reliability.

2 **RANGE OF POWER**
Paxman oilfield engines come in all sizes from 100 to 900 s.h.p.—the largest range with only one cylinder bore size.

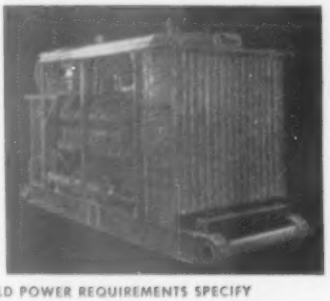
3 **INTERCHANGEABILITY**
70% of the wearing parts are interchangeable. Think what this means to store personnel—only one basic set of components for all Paxman engines being operated.

4 **ADAPTABILITY**
Close contact with the rig manufacturers, results in the Paxman "Package" unit being adaptable for use with any American or British make of rig.

12 RPH 400 s.h.p. "Package" Set.

5 **CHOICE OF FUEL**
Paxman engines are available to run on most grades of diesel fuel, or natural or other forms of gas; the gas engines are readily convertible to diesel fuel.

6 **SERVICE & SPARES**
The world-wide network of Paxman Agents and travelling engineers provide expert assistance. Paxman-guaranteed spares reach you in perfect condition within a few hours of receipt of order.



FOR ALL YOUR OILFIELD POWER REQUIREMENTS SPECIFY

PAXMAN

Copies of our oilfield literature are yours for the asking—write today!

DAVEY, PAXMAN & CO., LTD.
ENGINE DIVISION, COLCHESTER, ENGLAND
Associated with Ruston & Hornsby Ltd. Lincoln

NEW YORK REPRESENTATIVES: Beckley, Holtom & Hickman, The Americas Building, Rockefeller Center, 1270 Sixth Avenue, New York 20, N. Y. Telephone: Plaza 7-3276 Cables: DAHBECK

SEE OUR ADVERTISEMENT IN THE COMPOSITE CATALOG J-17

Teeth that bite deep in Western Canada

Oil drilling-bits were much rarer than dinosaur teeth in the rocks underlying Canada's prairie provinces until a few decades ago. Now, hundreds of drilling rigs and scores of refineries are capitalizing on the wealth that lies far below ground in Western Canada.

As a pioneer bank in Canadian oil, The Canadian Bank of Commerce will be glad to help you in any activities in which your own firm may be engaged—or may contemplate undertaking—in Canadian oil. We have more than 150 branches in the Sedimentary Basin, and a fully equipped Petroleum and Natural Gas Department located in Calgary, under the management of men of long experience in Canadian oil.

For further information, write to our Business Development Division, Head Office, Toronto 1, Canada—or direct to our Petroleum and Natural Gas Department, 309-8th Avenue West, Calgary, Alberta.

(We do not advise on the merits of specific oil securities)

THE CANADIAN BANK OF COMMERCE

Head Office—Toronto

New York • San Francisco • Los Angeles • Seattle • Portland, Ore.
Resident Representative—Chicago, and more than 700 Canadian Branches

CANADA—Where Oil Is King

blended into No. 2 F.F.O. or diesel. The synthetic-crude tower bottoms is employed in No. 6 F.O.

3. Polymerization and alkylation . . . The C_3-C_4 stream is split, with the propane-propylene cut going to a U.O.P. exchanger-type polymerization reactor. The effluent is C_3, L.P.G., and polymer gasoline.

The butane-butylene cut, plus a small, extraneous, isobutane rich stream is then charged to a M. W. Kellogg cascade type, sulfuric acid alkylation reactor. The unreacted butanes are used for vapor pressure adjustment on motor fuels, and the alkylate is employed in motor-fuel production only.

4. Ultraformer . . . Standard of Indiana developed the regenerative platinum-catalyst reforming process. Yields are for a 230°-360° F. Kuwait naphtha, 19 per cent naphthenes and 12 per cent aromatics. Three octane levels are cited, but plant operation has averaged about 90.0, which is below the capability of the unit.

The unit is designed for 3,600 bbl. per stream day, but platinum for only 3,000 bbl. per stream day was procured.

CRUDE TOPPING AND VACUUM UNIT

	B.P.S.D.	Vol. %
Crude	20,000	100
Gas (F.O.E.)	180	0.9
C_3-C_4	420	2.1
Light straightrun gasoline	1,700	8.5
Heavy straightrun gasoline	2,840	14.2
Stove oil (No. 1 F.F.O.)	2,300	11.5
Diesel	2,460	12.3
Heavy atmospheric gas oil	760	3.8
Vacuum gas oil	5,720	28.6
Cat feed	8,940	44.7
Vacuum tar	3,520	17.6

POLYMERIZATION AND ALKYLATION

	B.P.S.D.	Vol. %
C_3-C_4 feed	2,119	100
Propane L.P.G.	407	17.2
Butane	485	20.5
Polymer gasoline	189	8.0
Alkylate	1,027	43.4

FLUID COKING

	B.P.S.D.	Vol. %
Charge (vac. tar)	3,520	100
Gas (F.O.E.)	707	20.0
Light naphtha	68	1.9
Heavy naphtha	264	7.5
Light coker gas oil	1,566	44.5
Heavy coker gas oil	440	12.5
Coke, tons per day	122	

5. Hydrodesulfurization unit . . . The Shell "trickle" hydrodesulfurization unit is used in blocked operation on stove oil (No. 1 F.F.O.) and light catalytic-cycle oil. The hydrogen, of course, is supplied by the Ultraformer.

The operation of this unit has been excellent in every respect.

6. Treating facilities . . . Sour gasoline streams are sweetened in blocked operation by a Linde copper chloride (slurry type) unit. An exception is the heavy catalytically cracked gasoline which is inhibitor sweetened.

7. Fluid coking . . . The Esso fluid-coking unit is still under construction, although now nearing completion. It is presently expected that it shall be commissioned during August.

The yields presented are, of course, design figures. Experience in other units however, indicate that they will be very representative.

Finished Products

In the manner outlined in the block flow diagram, the streams from the units are combined in one way or another to give the following finished products:

1. C_3 L.P.G.
2. Premium and regular motor gasolines.
3. No. 1 F.F.O. (stove oil).
4. No. 2 F.F.O.
5. No. 6 F.F.O.
6. Fluid coke.

There is no aviation gasoline or jet fuel produced. All the alkylate is blended into premium gasoline.

The fluid-coke product cannot be used for metallurgical purposes because of high sulfur and metals content. However, a good market as fuel is available for this material.

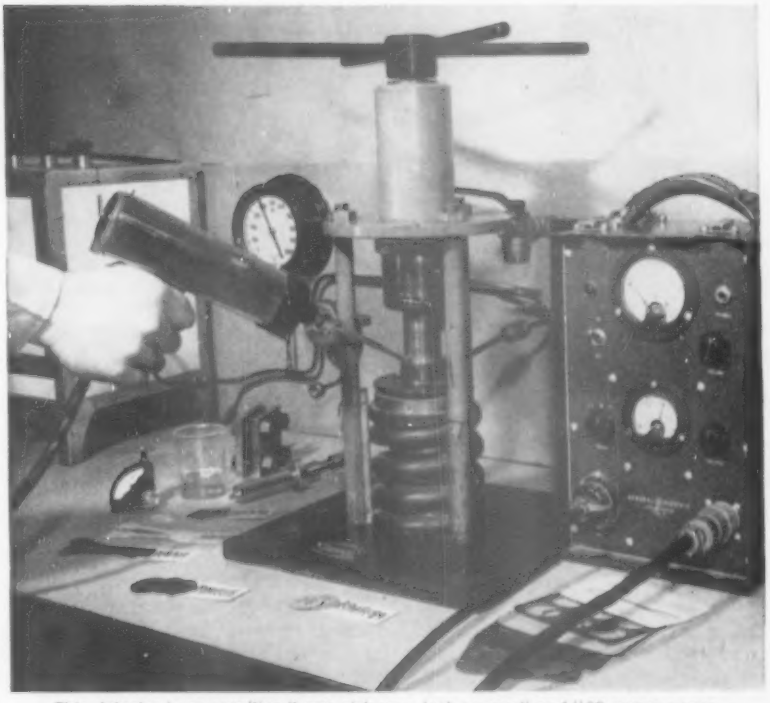
BOOKS

SYMPOSIUM ON METALLIC MATERIALS FOR SERVICE AT TEMPERATURES ABOVE 1,600° F. Published by A.S.T.M., 1916 Race Street, Philadelphia 3. 200 pp., heavy paper cover, $3.

This symposium, sponsored by the General Research Panel of the A.S.T.M.-A.S.M.E. Joint Committee on Effect of Temperature on the Properties of Metals, attempts to provide a basis of evaluation of a number of metallic materials. This includes cermets, which have been undergoing study in laboratories both here and abroad, to determine their suitability for higher temperature service.

The papers present a discussion of as many as possible of the properties—physical, chemical, and mechanical.

PANHANDLE AREA. Rinehart Oil News Co., Box 1208, Dallas. A comprehensive presentation of historical well data, and a forecast of future oil and gas development in the Panhandle area; Southeast Colorado, Southwest Kansas, Northeast New Mexico, and the Oklahoma and Texas Panhandles.



This detector is so sensitive it can pick up a leak as small as 1/100 ounce a year.

R/M SHEET PACKINGS ARE RIGIDLY TESTED FOR QUALITY BEFORE SHIPMENT

The leak detection test pictured above is just one of many run on R/M Sheet Packings to make certain they meet the high standards for which R/M is known. They are tested also for tensile strength, elongation, compression and recovery, compression set, flexibility, hardness and density. Additional tests for swell and volume change are run at elevated and room temperatures after immersion in oils.

R/M's line of sheet packings for the petroleum industry is complete and includes such outstanding examples as the following:

R/M No. K-68. Has exceptional non-cold-flow characteristics. Immersed in oil, its positive measured swell is less than 15%, and its tensile strength remains between 90 and 100% of original value. It is particularly recommended for equipment handling light petroleum fractions at high temperatures.

R/M No. B-40. Has controlled swell in oil without disintegration. Is excellent for stopping leaks caused by cover warping; for diesel engines where vibration is a factor; and where copper corrosion would be detrimental.

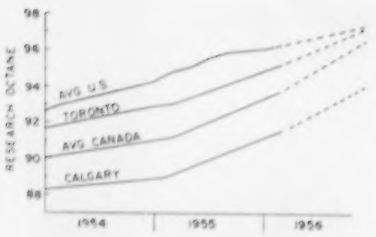
R/M MAKES A COMPLETE LINE OF MECHANICAL PACKINGS—including Vee-Flex, Vee-Square, Universal Plastic, and "Versi-pak"®; GASKETS, "TEFLON"* PRODUCTS. SEE YOUR R/M DISTRIBUTOR.

*Du Pont trademark

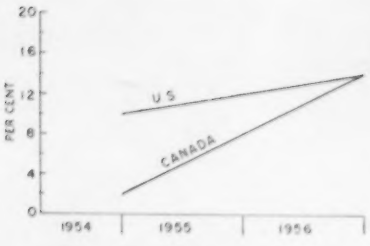
R/M PACKINGS
RAYBESTOS-MANHATTAN, INC.
PACKING DIVISION, PASSAIC, N.J.
MECHANICAL PACKINGS AND GASKET MATERIALS

FACTORIES: Bridgeport, Conn.; Manheim, Pa.; No. Charleston, S.C.; Passaic, N.J.; Neenah, Wis.; Crawfordsville, Ind.; Peterborough, Ontario, Canada

RAYBESTOS-MANHATTAN, INC., Packings • Asbestos Textiles • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Rubber Covered Equipment • Brake Linings • Brake Blocks • Clutch Facings • Laundry Pads and Covers • Bowling Balls



OCTANES of premium gasolines. Fig. 1.



CATALYTIC-REFORMING capacity—per cent of crude capacity. Fig. 2.

Canadian Octanes Approach United States Levels

by J. A. Nevison and H. R. Crane

THE average Canadian premium gasoline is only two octanes below the average United States premium and a year from now we expect this difference to be one octane or less. The general octane trends are shown in Fig. 1.

During 1954 the United States octanes increased faster than the Canadian octanes, but during 1955 the Canadian slope was steeper. We predict that the octanes of premium gasoline will continue to rise sharply and will approach United States levels. The reason for this prediction is shown in Fig. 2.

At the beginning of 1955 the catalytic-reforming capacity in Canada was only 2 per cent of crude running, which was only a small fraction of that available in the States. Construction of catalytic reformers in Canada during the past year, however, has increased capacity to about 10 per cent of crude running and by the end of the year, it should hit 14 per cent which is as high as any country can boast.

It's anybody's guess how extensive catalytic-reforming capacity might be by 1960 when more cracked stocks, wider boiling-range feeds, and poorer quality stocks will be included in the reforming charge.

Catformer usage in Canada . . . Over one-third of all catalytic reformers operating or under construction in Canada are Catformers. Five units are now on stream, the first of which was located at the Calgary refinery of The British American Oil Co., Ltd. It started on stream in February 1955 and is still operating on the initial charge of catalyst.

The charge stock is made up of naphtha from several different crude sources in Canada. Most of the operation has been on a full-boiling-range naphtha, but part of the time a reformer stock has been charged as dictated by refining scheduling of the two crude units. There is no feed preparation, although the feed does pass through an existing cold-clay vessel which serves as a filter.

The reformate has been maintained at 80 R.O.N., clear, or 94 octane with the addition of 3.6 ml. TEL per imperial gallon during most of the year, and up to 90 octane, clear, for testing periods. The reformate plus thermally cracked and straightrun naphthas represent the entire gasoline pool since no cat cracking or polymerization facilities are available.

The yield-octane plot of Fig. 3 shows the results of three actual test runs. The high-severity run was made at a catalyst life of 32 bbl. per lb. In each case, the yields are several per cent higher than the yields guaranteed for the 48.0 octane feed with 0.083 per cent sulfur. (At this time the catalyst has processed more than 90 bbl. per lb., and there has been no need for regeneration.)

Production Methods

Soon the Canadian refiners will be facing the problem of marketing near 100 octane motor fuels. Catalytic reforming alone or supplemented with other techniques will have to provide a solution to this problem. A method must be devised to produce high-octane components to satisfy the premium market. We have fully examined several techniques for producing superoctanes such as thermal reforming of reformates, in which the low-octane components are cracked out.

After polymerization of the C_3 and C_4 olefins that are produced, and after blending of the polymer back with the upgraded naphtha, a favorable yield-octane balance will result. Another method is to separate the high-octane material from the reformate and to recycle the low-octane portion back to the Catformer with fresh feed. Still another approach is to separate the reformate into high and low-octane fractions by simple distillation and to use these selected streams as a means for meeting premium and regular requirements.

This last technique does not increase the total pool octane of the refinery, but it does offer a simple, relatively inexpensive means of producing high-octane-blend components to satisfy requirements of premium-octane levels.

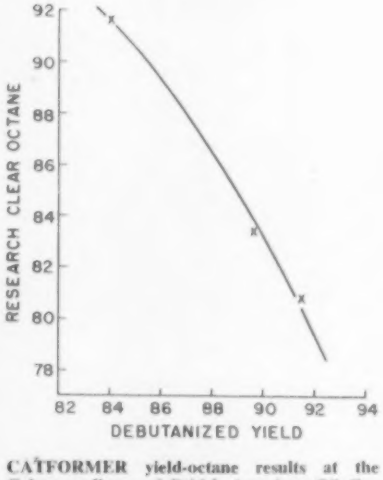
Many of the Canadian refiners are finding that, with the addition of proposed catalytic-reforming and other conventional refining facilities, they will be able to achieve the required total pool-octane level for several years to come, but will be unable to make the premium-gasoline octane levels.

One point is apparent to those refiners for whom we have made process evaluations. It is impossible at this time to justify combined thermal and catalytic reforming or recycle reforming if the total refinery-octane potential can be achieved without it.

The incremental investments for recycle reforming or two-stage reforming over conventional Catforming are two to six times as high as the additional investment for fractionating facilities.

In the same manner, the operating costs, excluding amortization, are two to six times as high, even after the

CANADA—Where Oil Is King



CATFORMER yield-octane results at the Calgary refinery of British American Oil Co., Ltd. Fig. 3.

DESIGNED FOR
. . . TESTED
AND PROVEN
IN THE OIL FIELDS

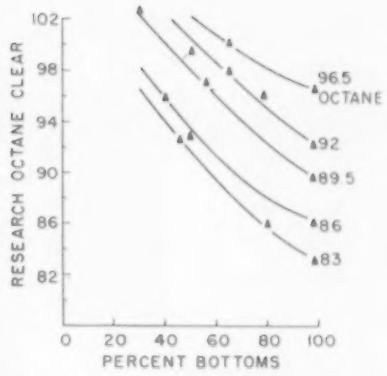
FIELDMASTER
BALL BEARING MOTORS

- VERMIN PROOF
- DRIP PROOF
- CORROSION RESISTANT
- MOISTURE PROOF
- FORCED AIR COOLED

Yes . . . all these features are combined in Fieldmaster Ball Bearing Motors to make them the leading power units in the oil country. Naturally there's a type and H.P. especially suited to fit your specific requirements.

Contact us for complete information on any motor requirement.

BETHLEHEM
SUPPLY COMPANY
TULSA, OKLAHOMA
Manufactured by
VALLEY ELECTRIC CORP.
ST. LOUIS 8, MISSOURI



OCTANES of Catformate fractions. Fig. 4.

proper charges are made for TEL, catalyst-life, and yield differences. Noting these large dollar differences, and recognizing that other octane builders can be added when and if required, we suggest the following techniques as a means of meeting octane demands.

Fractionation and reblending . . . Some typical reformates have been fractionated to remove the front end in varying quantities and octane ratings were obtained on all of the bottoms fractions. A family of curves was obtained, as shown in Fig. 4. As the lower octane components in the front end are removed, the octane of the remaining heavy portion increases.

For example, fractionation of a reformate of 83 R.O.N., clear, into two 50 per cent cuts would give a bottoms stream of 91 octane, clear, and on overhead naphtha of about 75 octane. If desired, a heavy aromatic concentrate of 100 octane, clear, could be made by cutting a 20 per cent bottoms fraction.

One refinery in eastern Canada plans to meet its immediate octane problem by fractionation of its reformate and cat cracked naphtha, and reblending to meet both octane and volatility requirements. The charge to the Catformer will be a depentanized Leduc-type naphtha which will give products in the yields shown in Fig. 5.

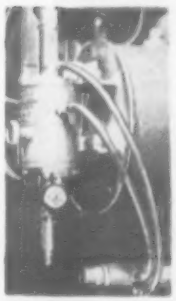
At a moderate severity of 86 per cent debutanized yield, product octanes would be 88 octane, clear, and 97.2 octane, with the addition of 3.6 ml. TEL per imperial gallon. The debutanized material has a Reid vapor pressure (R.v.p.) of 3.5 lb. By separation of this reformate into two 50 per cent pieces, cuts with the properties shown in Table 1 are obtained. The leaded octanes are 93.3 and 101.1 on the light and heavy cuts, respectively.

As shown in Table 2, the properties of the debutanized cat cracked naphtha are 4.1 lb. R.v.p., 92.3, clear, and 97.7 leaded octane. Splitting this naphtha into 50 per cent overhead and bot-

4 CANADIAN MADE

BM LTD. BARBER MACHINERY LTD. · CALGARY · EDMONTON

Barber
OILFIELD UNITS
Increase Efficiency of Your Operations. Reduce Costs.



STOP Engine Damage with a BARBER AIR-O-LARM
Automatically blows whistle, de-clutches, closes throttle in event of High Water Temperature or Low Oil Pressure.

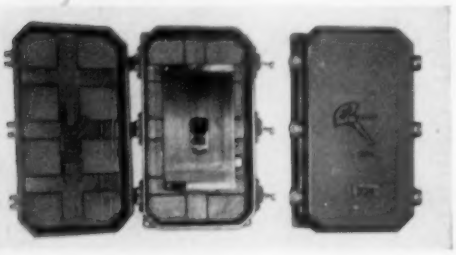
STOP Drilling Engine Runaways with this low cost BARBER RIG-SAVER
Protects engines from Natural Gas or Crude Oil runaways. Reduces fire hazard. All-weather operation. Remote control.

CONTROL Line Flow Easily, quickly with BARBER LINE-BLIND
Takes place of expensive valves and other such controls. Available for all sizes of heavy fluid lines. Can also act as union.

CONTROL MUD LEVEL with the efficient BARBER MUD ALARM
Operates by compressed air. Corrosion resistant diaphram. No caking problem. Controls mud to 1/2 inch level.
Available for immediate shipment to any oil operation in Canada.
Obtainable from leading supply houses or direct from the manufacturer.
Manufactured and serviced by
BARBER MACHINERY LTD.
Calgary—Edmonton

YOU'LL BE GLAD when you install NELSON water-tight and dust-tight air circuit breakers . . .

Inside and outside views: Nelson 225 ampere frame, 3-pole, 600-volt breaker with 125-ampere trip rating.



The dependable, trouble-free operation of Nelson water-tight and dust-tight (NEMA IV & V) air circuit breakers, is sure to please you.

1) These thermal-type breakers provide *dependable* circuit protection.
2) Enclosures are of high tensile cast iron, produced in our own foundry.
3) Hinged covers are securely held in place by swing bolts. Neoprene gaskets keep out water and dust.
4) Breakers can be furnished in ratings up to and including 600 amperes, 600 volts.

• Write for Bulletin No. 1012.

NELSON *Electric* MANUFACTURING CO.
TULSA, OKLAHOMA

Viscometer for more-efficient Refinery Control!

Hallikainen-Shell Development Co. Continuous-Indicating & Recording Viscometer

For measuring the viscosity of petroleum products with an overall accuracy of better than 1% of full-scale reading.

This instrument placed at the process unit not only decreases the cost of laboratory analysis, but also aids the operator in more efficiently controlling refining operations. Here are two examples:

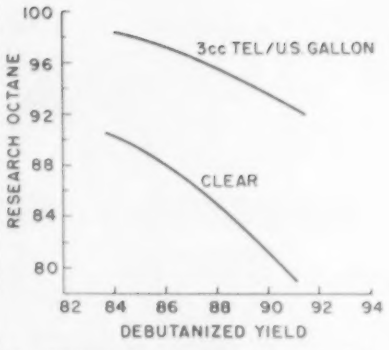
At a Dubbs unit a record was obtained of viscosity of the final blend of all streams comprising residual fuel-oil production. Having a continuous record of viscosity, closer control achieved a saving of 1 per cent of premium furnace oil from a residual fuel-oil stream of 17,000 B/D.

Another application on a lube-plant HVI column gave better control of cut points. Precise control of viscosity resulted in processing 600 B/D more of bright stock in MEK dewaxing unit because of increased filtration rates with better yields of finished product.

Ask for full details about this more-accurate time-saving Hallikainen-Shell Development Continuous-Indicating and Recording Viscometer. Write today.

Color Alarm • Thermometer Calibration Baths • Hydrogen Analyzer • Radiological Gas Analyzer • Alkylation Acid Analyzer • and other analytical instruments for continuous processes.

HALLIKAINEN *Instruments*
Industrial and Scientific
1341 Seventh Street, Berkeley, Calif.



CATFORMING with Leduc-type C_6 to 380° F. straightrun naphtha. Fig. 5.

toms gives fractions with 98.9 and 96.5 leaded octanes.

Then, as shown in Table 3, by blending equal quantities of the Catformer bottoms with the light cat cracked naphtha and adding mixed butanes to bring the R.v.p. to 10 lb., we get a premium gasoline of 100.1 octane with addition of 3.6 ml. TEL per imperial gallon. The blend at 10 lb. R.v.p. has 41 per cent evaporated at 212° F. and is an excellent premium fuel.

In Table 4 a blend of the two lower octane streams is shown. This blend of light reformate and heavy cat naphtha, with mixed butane for vapor pressure, gives a 95.6 Research octane rating. If regular sales exceed the premium volume, there will still be quantities of full-range reformate available to blend

THE AUTHORS

J. A. NEVISON

H. R. CRANE

John A. Nevison is head of the licensing section, research and development department, Atlantic Refining Co., Philadelphia. He has been with Atlantic since his graduation from Carnegie Tech with a chemical engineering degree in 1935. He was associated with major petrochemical development projects prior to joining the licensing group in 1953.

Henry R. Crane is a chemical engineer in Atlantic's licensing section in Philadelphia. He joined Atlantic's pilot unit development section immediately after his graduation from M. I. T. in 1949. He participated in the start-up of the first commercial Catformer in 1952 and has been with the licensing section since that time.

Nevison presented this article at the A.P.I. midyear refining meeting, Montreal, 1956, under the original title, "Catforming for High Octanes in Canada."

1 in 1940

today... **1425** in operation

and **75** more under construction

a record of installations that is incomparable
just as all Petrochem-Isoflow Furnaces
are more economically desirable by any comparison.

PETROCHEM-ISOFLOW FURNACES

UNLIMITED IN SIZE ... CAPACITY ... DUTY

PETRO-CHEM DEVELOPMENT CO., INC. • 122 EAST 42nd St., New York 17, N. Y.

REPRESENTATIVES:

Rawson & Co., Houston • Wm. H. Mason Co., Tulsa • Lester Oberholtz, Los Angeles • Faville-Levally, Chicago • D. D. Foster, Pittsburgh • Turbex, Philadelphia • Flagg, Brackett & Durgin, Boston • G. M. Wallace & Co., Denver & Salt Lake City

International Licensees and Representatives: SETEA—S.A. Comercial, Industrial, y de Estudios Tecnicos, Buenos Aires, Argentina • Industrial Proveedora, Caracas, Venezuela • Societe Anonyme Huertey, Paris, France • Societe Anonyme Belge, Liege, Belgium • Huertey Italiana S.P.A., Milan, Italy • Birwelco Ltd., Birmingham, England

Dry Moisture Twice As Fast!

USE

MOBILBEADS

(Formerly Sovabeads)

IN YOUR DEHYDRATOR!

- Nearly double dehydrator efficiency.
- Maintain efficiency at temperatures as high as 120°F.
- Provide longer desiccant bed life.
- Eliminate caking, reduce channeling, dusting and pressure drops.

Ask Your Socony Mobil Representative About Mobilbeads

SOCONY MOBIL

SOCONY MOBIL

Process Products

SOCONY MOBIL OIL COMPANY, INC.

26 Broadway, New York 4, N. Y., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP.

CANADA—Where Oil Is King

into the regular, further increasing its octane potential.

Going back to the 100 octane blend, and considering the addition of 25 per cent alkylate into the 50:50 mix, an even higher octane level is reached (see Table 5). The quality of the alkylate was taken as 94 and 104 octane, clear, and leaded, with a 6.5-lb. R.v.p. The

TABLE 1—LEDUC NAPHTHA

	Feed	C_5+ reformate
Yield	100.0	86.0
A.S.T.M. octane number (D 908, research method):		
Without TEL addition	50.0	88.0
With addition of 3.6 ml. TEL per imperial gallon		97.2
R.v.p., lb.		3.5
A.S.T.M. dist., °F.:		
I.b.p.		125
10 per cent point		190
50 per cent point		248
90 per cent point		330
End point		490

	50 per cent overhead	50 per cent bottoms
A.S.T.M. octane number (D 908, research method):		
Without TEL addition	78.7	97.3
With addition of 3.6 ml. TEL per imperial gallon	93.3	101.1
R.v.p., lb.	6.8	0
A.S.T.M. dist., °F.:		
I.b.p.	123	236
10 per cent point	165	252
50 per cent point	213	296
90 per cent point	234	351
End point	252	413

TABLE 2—DEBUTANIZED CAT CRACKED NAPHTHA

A.S.T.M. octane number (D 908, research method):	
Without TEL addition	92.3
With addition of 3.6 ml. TEL per imperial gallon	97.7
R.v.p., lb.	4.1
A.S.T.M. dist., °F.:	
Initial boiling point	111
10 per cent point	150
50 per cent point	254
90 per cent point	360
End point	402

	50 per cent overhead	50 per cent bottoms
A.S.T.M. octane number (D 908, research method):		
Without TEL addition	94.0	90.6
With addition of 3.6 ml. TEL per imperial gallon	98.9	96.5
R.v.p., lb.	7.9	0
A.S.T.M. distillation, °F.:		
Initial boiling point	105	241
10 per cent point	129	259
50 per cent point	190	313
90 per cent point	252	379
End point	275	406

WILLS, BICKLE
& COMPANY

MEMBERS OF

THE TORONTO STOCK EXCHANGE

THE INVESTMENT DEALERS' ASSOCIATION OF CANADA

44 King Street West
EMpire 8-3081
Toronto 1

"SCOT" FORGED

SEAMLESS

MINIMUM HARDNESS

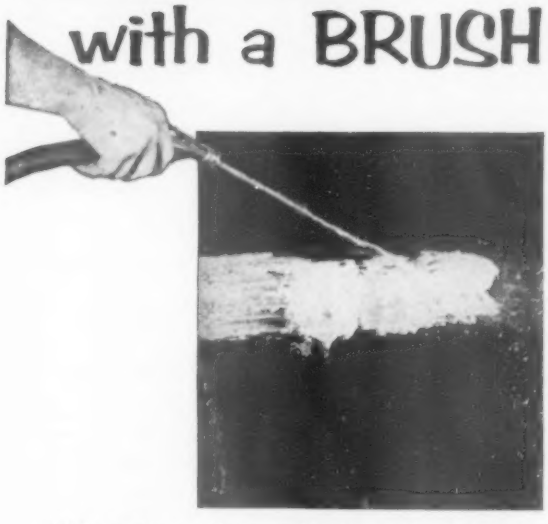
RING GASKETS

For ring groove flanges forged from reforging billets in all stainless, chrome, monel, copper, extra low carbon steel. Machined in all A.P.I.-A.S.A., special sizes, and other types.

Available through your supply store.

SOUTHERN CALIFORNIA
OIL TOOL COMPANY
8220 Atlantic Boulevard
P. O. Box 30, Bell, California

strip paint with a BRUSH



Take a stop watch in one hand and a brush full of Oakite Composition No. 57 in the other and see for yourself how this amazing new paint stripper goes to work in seconds . . . practically lifting the paint behind the brush.

See how Oakite Composition No. 57, paint stripper extraordinary, clings to vertical and inverted surfaces, eliminating costly waste. How easily loosened paint rinses away with water pressure spray.

Oakite Composition No. 57 is tops for removing those tough alkaline resistant paints from surfaces that just can't be dip-stripped. Get the full story today by writing for Special Report B-2415 and the Paint Stripping Handbook F-7893. Both FREE. Write Oakite Products, Inc., 52E Rector Street, New York 6, N. Y.

SPECIALIZED INDUSTRIAL CLEANING

OAKITE

MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U.S. & Canada

New Radiomarine Small Boat Radar

- Saves Money
- Saves Space
- Saves Power

MODEL CR-105-A

Especially designed for vessels on which space and power are limited, Radiomarine's new CR-105-A Radar offers you the EXTRA features that give you MAXIMUM PERFORMANCE—MAXIMUM CONVENIENCE—MINIMUM MAINTENANCE. Only two basic units—indicator and antenna. Indicator is in deck mounted binnacle . . . keeps picture tube high for best viewing . . . requires less than two square feet of deck space. Antenna is lightweight . . . only 105 pounds. Instant selection of 1-2-4-12-32 mile ranges helps you navigate through foul weather and traffic hazards to cut your trip-time, boost your profits. You'll read the clear, bright pictures on its 10-inch scope easier . . . service it quicker with the easy-access chassis. And here's another saving . . . the Radiomarine CR-105-A requires only 600 watts from ship's battery or other D.C. power supply. Find out more about the new Radiomarine CR-105-A . . . it can mean greater profits for you right now.

RCA®

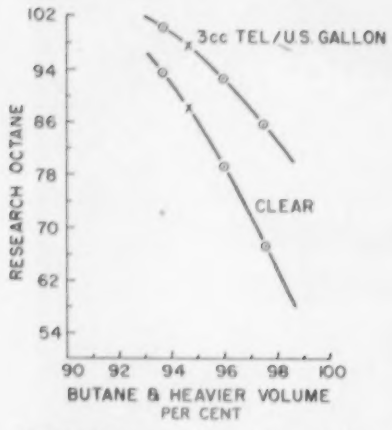
write for free information now!

RADIOMARINE CORPORATION of AMERICA

A SERVICE OF RADIO CORPORATION OF AMERICA

75 VARICK STREET, NEW YORK 13, N.Y.

CANADA—Where Oil Is King



CATFORMING Kuwait naphtha at 200° to 380° F. Fig. 6.

10-lb. mix comes out 101.1 octane and 42 per cent over at 212° F.

Without catalytic cracking . . . The foregoing examples were for reformates from a Leduc-type straightrun naphtha, but the same approach can be applied to almost any naphtha stream. As shown in Fig. 6, a 200° to 380° F. Kuwait naphtha Catforms to 88.2 octane, clear, or 97.7 leaded octane at a 94.6 per cent yield of butane-and-heavier, or an 85.0 per cent yield of pentane-and-heavier.

A 50 per cent bottoms cut from the debutanized reformate of this quality has a 98.0 octane number, clear, and 100.4 Research octane rating when leaded with 3.6 ml. TEL per imperial gallon (see Table 6). In this case, consider a refinery without catalytic cracking facilities. Light cat naphtha is not available. It is still necessary to blend a light high-octane component with the heavy reformate to get proper volatility characteristics and, at the same time, maintaining octane level. Isopentane is an ideal material for this purpose. A mixture of 40 per cent isopentane, 57 per cent reformate bottoms from Middle East naphtha, and 3 per cent butanes has a 10-lb. R.v.p. and 101.6 R.O.N. after lead addition.

Pentafining

Most refiners do not have large quantities of isopentane available. However, for those refiners who are located near gas wells or distillate fields and who process stocks containing a high percentage of pentanes, Pentafining[1] may be of real interest. Pentafining is a process for isomerization of normal pentane to isopentane and was developed and is licensed by Atlantic Refining Co. There are 30, clear, and 20 leaded units difference between the octanes of isopentane and normal pentane.

Because of the basic simplicity of Pentafining, the investment is only $100 to $150 per barrel, exclusive of fractionation which will vary, depending on feed composition and available facilities. Operating costs are in the order of 10 to 15 cents per barrel. Off-gas from the Catformer is used to supply the small hydrogen requirements.

Catalyst development . . . Continuing catalyst and process development is in the direction of catalysts that are durable enough to permit production of 95 to 100 octane, clear, reformates in conventional three-reactor units. A demonstration of extending Catformer operation into the production of such high-quality products directly has been made with excellent stability in our experimental process units.

The low-octane Middle East feed stock and attendant 95 and 98 octane, clear, reformates produced are shown in Table 7. A maximum flexibility is shown in producing either a specification-volatility gasoline or a high-boiling blending stock from the heavy Middle East naphtha feed.

TABLE 3
1 Part of 50 Per Cent Bottoms from Reformate Plus 1 Part of 50 Per Cent Overhead from Cat Naphtha Plus Mixed Butanes to 10 Lb. R.v.p.

A.S.T.M. octane number (D 908, research method):	
Without TEL addition	95.7
With addition of 3.6 ml. TEL per imperial gallon	100.1
R.v.p., lb.	10.0
A.S.T.M. distillation, °F.:	
Initial boiling point	80
10 per cent point	116
50 per cent point	290
90 per cent point	329
End point	409
Per cent at 212° F.	41

TABLE 4
1 Part of 50 Per Cent Overhead from Reformate Plus 1 Part of 50 Per Cent Bottoms from Cat Naphtha Plus Mixed Butanes to 10-Lb. R.v.p.

A.S.T.M. octane number (D 908, research method):	
Without TEL addition	86.1
With addition of 3.6 ml. TEL per imperial gallon	95.6
R.v.p., lb.	10.0
A.S.T.M. distillation, °F.:	
Initial boiling point	80
10 per cent point	118
50 per cent point	244
90 per cent point	358
End point	401
Per cent at 212° F.	38

Reference

1. "Pentafining," The Oil and Gas Journal, 54 (46) 183 (1956).

TABLE 5
Blend of 25 Per Cent Alkylate in 50 : 50 Mix of Reformate Bottoms and Light Cat Naphtha Plus Butanes

A.S.T.M. octane number (D 908, research method):	
Without TEL addition	95.3
With addition of 3.6 ml. TEL per imperial gallon	101.0
R.v.p., lb.	10.0
Per cent at 212° F.	42
Properties of alkylate—	
A.S.T.M. octane number (D 908, research method):	
Without TEL addition	94.0
With addition of 3.6 ml. TEL per imperial gallon	104.0
R.v.p., lb.	6.5
Per cent at 212° F.	35

TABLE 6—KUWAIT NAPHTHA

Yield, C_5+ reformate	85.0
A.S.T.M. octane number (D 908, research method):	
Without TEL addition	87.4
With addition of 3.6 ml. TEL per imperial gallon	97.3
50 per cent bottoms from C_5+ reformate—	
A.S.T.M. octane number (D 908, research method):	
Without TEL addition	98.0
With addition of 3.6 ml. TEL per imperial gallon	100.4
R.v.p., lb.	0
A.S.T.M. distillation, °F.:	
Initial boiling point	238
10 per cent point	261
50 per cent point	303
90 per cent point	353
End point	396
Blend of: 57 per cent reformate bottoms 40 per cent isopentane 3 per cent butanes	
A.S.T.M. octane number (D-908, research method):	
Without TEL addition	95.4
With addition of 3.6 ml. TEL per imperial gallon	101.6
R.v.p., lb.	10.0
Per cent at 212° F.	43

TABLE 7—CATFORMING KUWAIT NAPHTHA AT HIGH SEVERITY

	Feed	Reformates		
		High	Moderate	Moderate
Operating pressure		95.0	95.0	99.0
Research octane, clear	31.9	95.0	95.0	99.0
3.6 ml. TEL per imperial gallon	61.0	102.0	102.0	104.1
C_5 and heavier, volume per cent yield		69.0	77.8	71.1
A.S.T.M. distillation, °F.:				
I.b.p.	276	100		100
10 per cent	288	125		150
30 per cent	294	166		220
50 per cent	300	239		290
90 per cent	320	315		339
End point	364	370		406

by W. L. Nelson
Technical Editor

Scale and USMC Tanker Rates

We notice that some tanker rates in The Oil and Gas Journal are given a Scale plus or minus a percentage as well as USMC rates. What does the Scale rate mean in terms of the more familiar USMC rates? R.W.P.

There can be no specific relationship between the USMC and Scale rates because they are used in different regions by different operators. However, there are approximate mathematical relationships by which a USMC rate can be converted to its equivalent Scale rate.

United States Maritime Commission (USMC) basic rates were issued late in World War II and although the commission is no longer in existence, the USMC basic rate orders are still widely used. *(See Nelson, W. L., Cost of Tanker Transportation . . ., The Oil and Gas Journal, September 7, 1953, p. 113.)* Scale is the abbreviation used in referring to the London Market Tanker Nominal Freight Scale, which was established first during November 1952. Scale basic rates are replacing the older British Ministry of Transport (M.O.T.) basic rates.

USMC basic rates already include tolls for the Panama Canal and Suez Canal (6s 3d or about 88 cents per shippers ton) but these tolls must be added to Scale basic rates. It must also be noted that the rates are also dependent on the number of loading or discharging ports, laytime and demurrage, and other special considerations. However, if these differences are neglected, the approximate relationship between the basic rates is:

$$\text{USMC} = 1.66\ \text{Scale} - 1.46 \quad (1)$$

or

$$\text{Scale} = 0.602\ \text{USMC} + 0.88 \quad (2)$$

Thus, a basic USMC rate of $10.00 per shippers ton corresponds to a Scale basic rate of $6.90:

$$0.602 \times 10 + 0.88 = \$6.90$$

Fig. 1 shows the general accuracy of the basic rate equations. This does not mean that Scale tanker rates are cheaper than USMC tanker rates; it simply means that the basic rates upon which Scale rates are based are lower than USMC basic rates. The equations are reasonably accurate for basic USMC rates above about $2.80 (Scale about $2.50) but they are not valid for lower basic rates (short hauls).

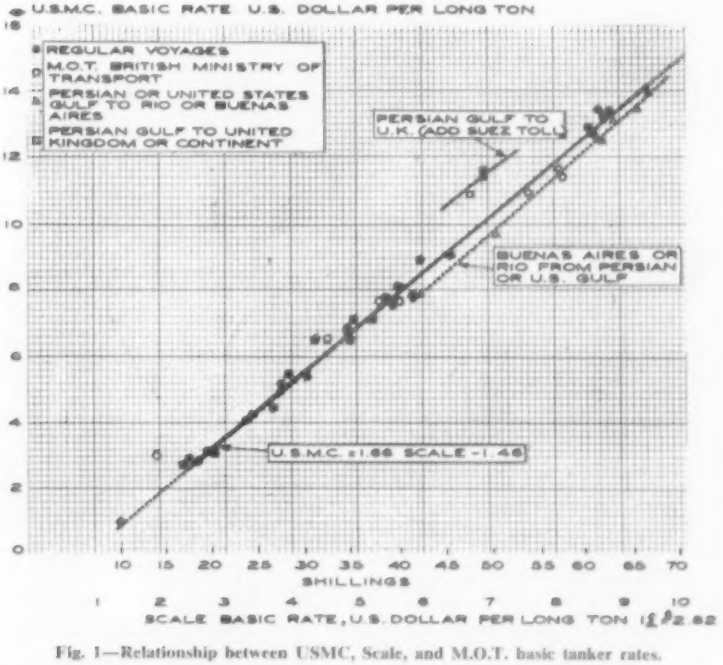

U.S.M.C. BASIC RATE U.S. DOLLAR PER LONG TON
REGULAR VOYAGES
M.O.T. BRITISH MINISTRY OF TRANSPORT
PERSIAN OR UNITED STATES GULF TO RIO OR BUENAS AIRES
PERSIAN GULF TO UNITED KINGDOM OR CONTINENT
PERSIAN GULF TO U.K. (ADD SUEZ TOLL)
BUENAS AIRES OR RIO FROM PERSIAN OR U.S. GULF
U.S.M.C. = 1.66 SCALE - 1.46
SHILLINGS
SCALE BASIC RATE, U.S. DOLLAR PER LONG TON

Fig. 1—Relationship between USMC, Scale, and M.O.T. basic tanker rates.

Actual tanker rates . . . The actual charter rates at any moment are described as plus or minus percentages of the basic rates. Inasmuch as the basic rates of USMC and Scale are not the same, it is evident that the percentage added to (or subtracted from) a basic USMC rate will be different from the percentage that would be added to a Scale basic rate. If "x" represents the percentage used with the USMC basic rate and "y" the percentage used with a Scale basic rate, and if the actual rates for both kinds of tanker rates rise or fall in the same ratio:

$$y = \frac{(100 + x)\ \text{USMC}}{0.602\ \text{USMC} + 0.88} - 100 \quad (3)$$

and

$$x = \frac{(100 + y)\ \text{Scale}}{1.66\ \text{Scale} - 1.46} - 100 \quad (4)$$

The known conditions are grouped on the right side of the equation.

As an example, the basic USMC Rate from Netherlands West Indies to Montreal is $4.25. According to Equation 1 the Scale basic rate should be:

$$0.602 \times 4.25 + 0.88 = \$3.44$$

The actual Scale rate is 23s 8d or about $3.43. Recently, actual rates have been USMC + 50 per cent or x = 50. The corresponding percentage (y) on the basic Scale rate, if charters by both kinds of rates rise in the same proportion, should be (see Equation 3):

$$y = \frac{(100 + 50)\ 4.25}{0.602 \times 4.25 + 0.88} - 100$$

$$y = \frac{638}{3.44} - 100 = 85$$

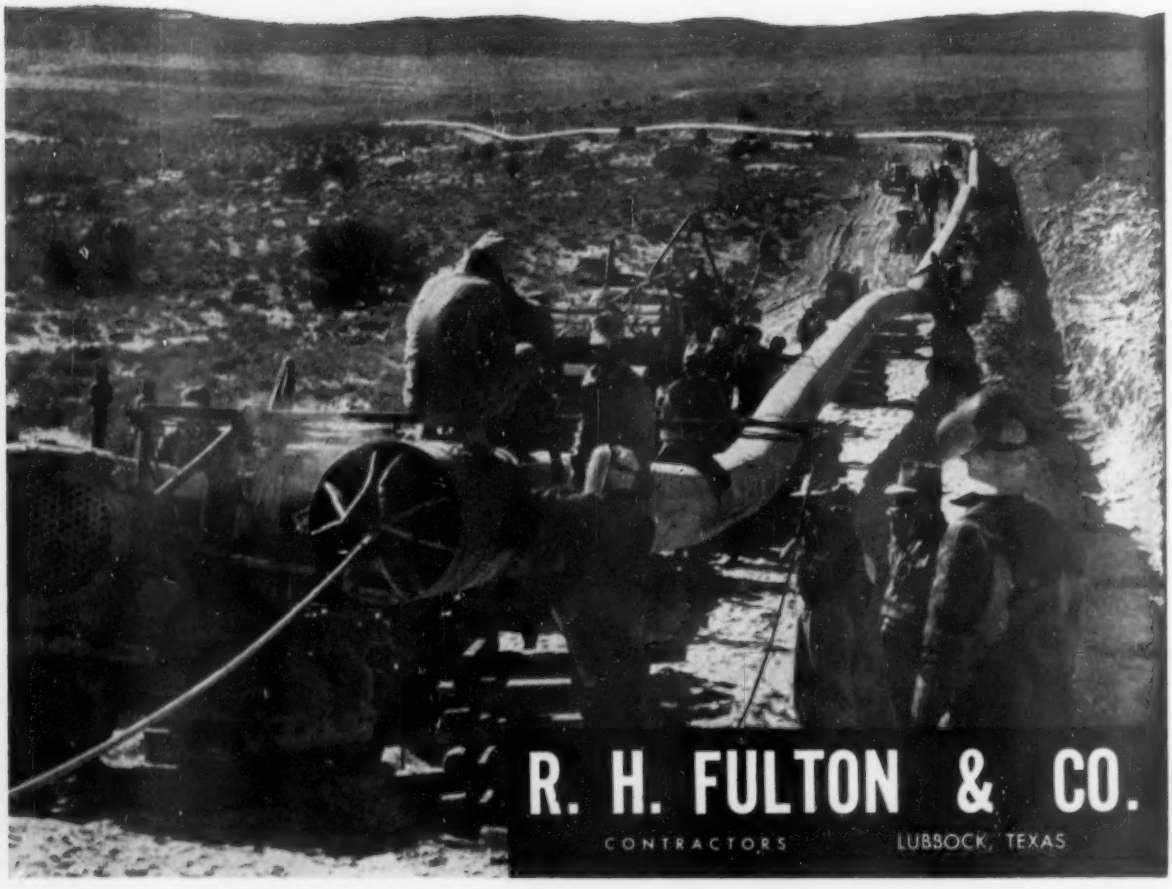
Thus, the corresponding Scale rate should be Scale + 85 per cent.

There is not much opportunity to check the above relationships, but if active competition for the same voyage occurs, it is reasonable to expect that rates stated either in terms of USMC or Scale will increase or decrease proportionally as indicated by these equations. Note again that passage through canals will make the equations invalid, because canal tolls must be added to the Scale basic rate before percentages are applied.

PIPELINES

ACROSS THE CONTINENT . . .

OIL LINES
WATER PIPELINES
RIVER CROSSINGS
PRODUCTS PIPELINES
GAS PIPELINE CONSTRUCTION



Pipeline Patrol

. . . Report on Construction

Under Way, Contracted, and Planned

PIPELINE activity reported here is compiled from surveys conducted by The Oil and Gas Journal among pipeline companies and contracting firms. Projects listed include those proposed, contracted, and under way. Uncontracted projects are indicated by • preceding the project.

Crude-Oil Pipelines

Buckeye Pipe Line Co.—Will complete in October or November 1956, own reconditioning of 191 miles of 8-in. from Griffity, Ind., to Lima, Ohio.

• **Gulf Oil Corp.**—Will build 33 miles of 8-in. from Citronelle field to Mobile, Ala., to be completed late summer 1956.

Lakehead Pipe Line Co., Inc.—Anderson Brothers Corp. has under way 51 miles of 26-in. looping from Viking to Plummer, Minn., to complete August 31, 1956. It is in conjunction with 69 miles of 24 and 26-in. to be completed this summer by Interprovincial Pipe Line Co. (See Interprovincial, foreign crude.)

• **Magnolia Pipe Line Co.**—Plans 36 miles of 12-in. from Andrews to Midland, Tex., to be completed January 1, 1957.

• **Mid-Continent Pipe Line Co.**—Plans 10 miles of 6-in. to extend gathering system in Washington and Freeny pools, Oklahoma, to complete in August 1956.

Northwest Pipeline Corp. (an affiliate of Pacific Northwest Pipeline Corp.)—Will build 350 miles of 8-in. crude and products line from Four Corners area to Salt Lake City, to be completed August 1957.

• **Offshore Gathering Corp., Houston.**—Proposes 364 miles of mostly 20-in. in Gulf of Mexico off Louisiana.

• **Pasotex Pipe Line Co.**—Plans 127 miles of 20-in. along its route from Wink to El Paso, retiring another dual 8-in. section, to complete July 31, 1957.

• **Shannon Oil Co., Denver.**—Plans with Farmers Union Central Exchange, Inc., and Mule Creek Oil Co., both of Billings, Mont., a 34-mile, 6-in. line from Murphy Dome in Hot Springs County, Wyoming, to contact Ohio Oil Co.'s line in Big Horn County. Construction to start in August, end by December 1, 1956.

• **Shell Pipe Line Corp.**—Has let contract for 41.5 miles of 10-in. from Shell's Houston refinery to Brookshire Station, to complete by December 1, 1956. Bill Murry is spread superintendent for Bill Murry & Co., contractors. Spread office: 12629 South Main, Houston 25, Tex.

• **Sinclair Pipe Line Co.**—Plans 150 miles of 20-in. from Teague, Tex., to Houston.

• **Tecumseh Pipe Line System.**—190 miles of 20-in. will be built by Sinclair Refining Co., Pure Oil Co., Ashland Oil & Refining Co., between East Chicago and Cygnet, Ohio, to be completed September 1957.

• **Union Oil Co. of California.**—Proposes 815-mile line from Rifle, Colo., to Los Angeles refining area, to carry products from its proposed Rifle shale-oil plant.

Will build 225 miles of 16-in. from San Joaquin Valley to its refinery at Oleum, Calif., to be completed late 1957.

Products Pipelines

• **American Pipe Line Co.**—Received ODM approval to amortize 40 per cent of $178,000,000 with a rapid writeoff on proposed line from Gulf Coast area to New York City area.

• **Cities Service Oil Co. & Subsidiaries.**—Plans a 10-mile, 6-in. L.P.G. line from Maysville to near Pauls Valley, Okla., to tie in to Shell line moving on to Cushing, Okla.

• **El Paso Natural Gas Co.**—Plans 240 miles of "larger than 6-in." to carry natural gasoline, butane, and propane, from its Midkiff natural-gasoline plant in Permian basin, Midland County, to El Paso. Has under way 96 miles of 8-in. in New Mexico, from its Blanco plant to its Wingate plant.

• **Gulf Refining Co.**—Will build 45 miles of 8-in. from Pontiac Eastern Corp.'s planned refinery at Hattiesburg, Miss. (due on stream May 1957) to a connection with Plantation Pipe Line Co.'s system. No date set to start.

Magnolia Pipe Line Co.—Plans a 30-mile, 8-in. line from Andrews to Dollarhide, Tex., to complete January 1, 1957, and an L.P.G. line, 19 miles of 6-in., 3 miles of 4-in. from Beaumont to Orange, Tex. Brown & Root has under way a 75-mile, 8-in. L.P.G. line from Hull to Texas City, Tex., to complete January 1, 1957.

• **Mid-Continent Pipe Line Co.**—Has let contract to E. Voigt, Inc., for 12 miles of 4-in. to connect natural gasoline plant at Fox, Okla. Completion is scheduled for August 1956.

• **Phillips Chemical Co.**—Panama Williams Corp. has contract to build 76 miles of 6-in. from Pasadena to Sweeny, Tex., for L.P.G., to complete by September 1, 1956. Spread office is in South Houston, and W. H. Shiplett is spread superintendent.

• **Phillips Petroleum Co.**—Plans 15 miles of 6-in. L.P.G. line in Sweeny, Tex., area, to be completed September 15, 1956.

• **Phillips Pipe Line Co.**—Plans 135 miles of 12-in. looping between Borger, Tex., and St. Louis, Mo., to be completed December 31, 1956.

Plantation Pipe Line Co.—Oklahoma Pipe Line Constructors has under way 327 miles of 18-in. from Baton Rouge to Helena, Ala., to complete December 1956, N. L. Arie, spread man, office at Baton Rouge.

• **Shell Oil Co., Pipe Line Department, Pacific Coast.**—Plans to convert 13 miles of existing 4-in. gasoline line, and add 3 miles of new line, to move gasoline from Wilmington refinery to Los Angeles. To be completed January 1, 1957.

• **Sioux Oil Co.**—Plans 80 miles of 4-in. from its Newcastle, Wyo., refinery to Rapid City, S. D., to be completed late 1956.

• **Sohio Petroleum Co.**—Plans 37 miles of 8-in. from Mogadore to Girard, Ohio, to complete November 1, 1956.

• **Southern Pacific Pipe Lines, Inc.**—Plans a 300-mile line to span the Sierras and connect San Francisco with Reno and Fallon, Nev., and to serve the Sacramento Valley.

Sun Pipe Line Co.—Contracts let on 109 miles of 14-in. from Twin Oaks, Pa., to Newark, N. J.: Sheehan Pipe Line Construction, 90 miles from Twin Oaks to Plainfield, N. J., J. W. Brown, spreadman, office at Malvern, Pa.; Delaney-Missouri Valley Construction Co., remainder. Missouri Valley Dredging Co. has river crossings at Delaware, Schuykill, and Raritan rivers. Work started May 1, to end September 1956. Line replaces present 8-in. line.

• **Sunflower Pipe Line System.**—Has Kansas Corporation Commission approval for 215 miles of 6-in. to move L.P.G. from six counties in western Kansas to Wichita.

Non-Petroleum Pipelines

• **American Gilsonite Co.**—Plans 70 miles of 6-in. from Bonanza, Utah, to Grand Junction, Colo., to carry slurry of gilsonite from mines to refinery now being built.

Pittsburgh Consolidated Coal Co.—Let to Williams Brothers, 108 miles of 10-in. from its mines in eastern Ohio to Cleveland Electric Illuminating Co.'s Eastlake power plant northeast of Cleveland. Work started April 1, 1956, on this first line to move coal, with Ford, Bacon & Davis, Inc., handling specifications, contracts, construction supervision.

Natural-Gas Pipelines

American Louisiana Pipe Line Co.—Let bulk of 1,160-mile line from North Tepetate, La., to Detroit. H. C. Price and Houston Contracting Co. have 770 miles of 30-in. from near Willow Run, Mich., to near Eudora, Ark.

Price started May 1 on 83 miles in Tennessee, R. E. Ezell, spread superintendent, office at Brownsville, Tenn.; 31 miles in Indiana, C. E. Shivel, spread superintendent, office at French Lick, Ind.; 83 miles in Kentucky, C. R. Ice, spread superintendent, office at Princeton, Ky.; 31 miles in Indiana, W. H. Olrich, spread superintendent, office at Edinburg, Ind.

Brown & Root has 221 miles of 30-in. from North Tepetate to Arkansas-Louisiana border (which is subcontracted to Associated Pipe Line Contractors and Western Contractors), and 39 miles of 16-in. under-water line which it will lay itself. Western Contractors expects to complete its 100 miles August 1956. W. B. Williams, spread man, office at Eunice.

Houston Contracting Co. and H. C. Price Co. will start early August 1956 on 121 miles of 22-in. from Payne, Ohio, to Bridgman, Mich. Houston will lay 75 miles on eastern section, E. C. Norris, spread man; Price will lay 46 miles on the west. Work to end fall 1956.

Houston Contracting Co. started August 1, on 21 miles of 24-in. from Tepetate to Lewisburg, La., R. E. Thornton, supt., office at Eunice.

• **Arkansas Louisiana Gas Co.**—Has long-range plans for line from Texas-Louisiana coastal region to northern Louisiana, to connect with their present system.

Atlantic Seaboard Corp.—Williams-Austin Co. has under way 50 miles of 24-in. from Hardy County, West Virginia, to Greene County, Virginia, O. L. Martin, spread man, office at Elkton, Va., and 32 miles of 26-in. loops along the Cobb-Rockville line in West Virginia. Ralph Gaddy, spread man, office at Elkins, W. Va., both to be completed November 1, 1956.

• **Carolina Pipeline Co.**—Has received South Carolina Public Service Commission permit to distribute gas in central South Carolina. Plans lines to 14 cities. Will buy gas from Transcontinental Gas Pipeline Co. or Southern Natural Gas Co.

• **Cities Service Gas Co.**—Plans 12 miles of 30-in. and 17 miles of 20-in. between Oklahoma City and Mulhall, Okla., to be completed October 1, 1956.

Prairie Construction Co., Inc., has 28 miles of 16-in. between Leavenworth, Kans., and St. Joseph, Mo., to complete August 15, 1956; 9 miles of 16-in. near Springfield, Mo., to

Experience can keep you out of trouble in fighting corrosion, too.

Why gamble with "unknown quantities" when it comes to protecting pipe, pipe joints, couplings and other vulnerable surfaces above and below ground?

Since 1941, TAPECOAT, the quality coal tar coating in handy tape form, has demonstrated its ability to withstand corrosion year after year. In case after case, TAPECOATed lines have been dug up after 10 years of service *with no signs of deterioration on the pipe surfaces uncovered*. That's why TAPECOAT is specified by those who know that continuing protection is the first consideration.

Everything considered, you'll be money ahead by using TAPECOAT to give you the quality protection you need for reduced maintenance and replacement cost.

Write for brochure and prices.

The TAPECOAT® *Company*

Originators of Coal Tar Coating in Tape Form

1539 Lyons Street
Evanston, Illinois

Pipeline Patrol

complete October 1, 1956; 4 miles of 12-in. from Johnson County to Lafayette County, Missouri, to complete September 1, 1956.

• **Coastal Transmission Corp.**—Applied to FPC for 565 miles of 22-26-in. from McAllen, Tex., to Baton Rouge, to deliver to Houston Texas Gas & Oil Co.'s proposed line to Florida. Plans 272 miles of smaller gathering lines.

• **Colonial Natural Gas Corp.**—Proposes two systems: One between Houston-Lake Charles area and Miami, Fla.; one in the Carolinas and Georgia.

• **Colorado Interstate Gas Co.**—R. H. Fulton has 238 miles of 22-in. from Laramie to Green River, Wyo. (last part of a 374-mile line between Denver and Rock Springs), to be completed fall 1956. Filed, March 29, for FPC permit for 1957 program: 307 miles of 30-in. from Idalia, Colo., to Beatrice, Neb., to take gas from a planned 165-mile, 26-in. line from near Carr, Colo., to Idalia, and from a 72-mile, 26-in. line from near Kit Carson, Colo. to Idalia; 215 miles of 20 and 24-in. to parallel present line from Texas Panhandle area to Kit Carson; 34 miles of 16-in. from Keyes field, Oklahoma, and Greenwood field, Kansas, to the new north-south line.

• **Colorado-Wyoming Gas Co.**—Plans 11 miles of 16-in., 2 miles of 12-in., and 2 miles of 8-in. looping north of Denver, to be completed November 1956.

El Paso Natural Gas Co.—Has under way 193 miles of 34-in. between San Juan basin and Topock, Ariz., and 38 miles of 20-in. between San Juan mainline and Phoenix, both to be completed February 1, 1957. Western Pipeline, Inc. has under way 146 miles of 34-in. between San Juan basin and Topock, to be completed February 1, 1957, and 112 miles of 20-in. between San Juan mainline and Phoenix, to be completed November 1, 1956. El Paso also has under way 34 miles of 24-in. from Ignacio, Colo., to the Blanco plant, to be completed October 1, 1956.

Filed June 1956 for FPC permit for 888 miles of field and main lines in Texas, New Mexico, and Arizona.

• **Empire Southern Gas Co.**—Groninger & King Construction Co. has a 4-mile, 8-in. loop south out of Pampa, Tex. A 9-mile, 8-in. loop northwest out of Big Spring, Tex., to be completed September 1, 1956, not let.

• **Hope Natural Gas Co.**—Plans 22 miles of 8-in. in Logan County, West Virginia, and 20 miles of 3 to 8-in. in various West Virginia counties, to be completed in 1956.

• **Houston Texas Gas & Oil Co.**—Applied to FPC for 960 miles between Baton Rouge and Miami: 507 miles of 30-in., 157 miles of 26-in., 61 miles of 20-in., 224 miles of 18-in., 12 miles of 12-in. Plans 500 miles of sales laterals in Florida, with main line joining Coastal Transmission's proposed line from McAllen, Tex., to Baton Rouge.

• **Iron Ranges Natural Gas Co., St. Paul.**—Applied to FPC for a 68-mile transmission line and 47 miles of laterals to supply towns on the Mesabi Iron Range, Minnesota.

• **Kansas-Nebraska Natural Gas Co., Inc.**—Has FPC permit for 11 miles of 12-in. from Colby to Oakley, Kans., to be completed August 1956. Plans 10 miles of 10-in. and 10 miles of 8-in. from Grand Island to Albion, Neb., to be completed November 1956.

• **Lone Star Gas Co.**—Has two plans before FPC to enlarge system in Texas and Oklahoma: one is a 230-mile line from Cotton County, Oklahoma, to Fritch, Tex.; one is a 205-mile line from Snyder, Tex., to a hookup with the Cotton-Fritch line. Plans are attempt to keep Natural Gas Pipeline Co. of America from building line from Wise County, Texas, to Fritch.

COATES Field Service, INC.
P.O. Box 1581 OKLA. CITY
Thoroughly Specialized
RIGHT-OF-WAY PROCUREMENT
From Title Search . . .
. . . To Damage Claims

S. E. HUEY & CO.
ENGINEERS & SURVEYORS
HENINGER BLDG.
MONROE, LA.
SURVEYING & MAPPING
PIPE LINE SURVEYS

the lifetime of the Coating is the lifetime of . . .
OWENS-CORNING FIBERGLAS
COROMAT
. . . a flexible mat, made from glass fibers bonded with an elastic resin, reinforces enamel on underground pipe. Coromat adds strength, where strength is needed, to the coating during application and in service.
MIDWESTERN PIPE LINE PRODUCTS CO.
Box 1886 Tulsa, Oklahoma

SAFETY SEALING STOPPERS
for pipe line testing
NO BOLTS, NO NUTS, NO WELDING!
Save time — save money
Write for descriptive literature.
Anderson & Grunskey
266 Lombard St.
San Francisco 11, Calif.

Pipeline Patrol

Michigan Consolidated Gas Co.—Somerville Construction Co. has under way 67 miles of 10 and 12-in. between Sears and Travers City, Mich., Floyd Huduall, superintendent, office at Cadillac. Somerville, jointly with H. L. Gentry Construction, has under way 60 miles of 10 and 12-in. between Muskegon and Ludington, Mich., Frank Morris, superintendent, office at Hart.

• **Michigan Wisconsin Pipe Line Co.**—Has FPC permit for 252 miles of 24, 18, 12, 6, and 4-in. loops in Wisconsin, to be completed November 1956.

Latex Construction Co., jointly with Houston Construction Co. and H. C. Price Co., has 90 miles of 16 and 20-in. between Milwaukee and Oshkosh, to start June 25 and complete October 1, 1956, John Phipps and U. J. Davenport, spread men, office at Fond du Lac.

H. C. Price Co. and Houston Contracting Co. will build 149.4 miles of loop lines in Wisconsin and Illinois. Price will construct 56 miles of 24-in., and Houston will build 42.4 miles of 20-in. and 51 miles of 16-in. (being handled by Latex Construction Co. of Georgia, office at Fond du lac, Wis., 20 miles completed).

• **Midwestern Gas Transmission Co.**—Will build a main line from Portland, Tenn., to Canadian border near Emerson, Man.; 829 miles of 24-in., 109 miles of 16-in., 174 miles of 12-in. Plans 648 miles of 3 to 18-in. extensions in Minnesota and Wisconsin, pending FPC approval.

• **Montana-Dakota Utilities Co.**—Awarded contract to Ross Powers Construction Co., Billings, Mont., to start in August 1956, on 28 miles of 12-in. from Fallon County to Dawson County, Montana.

Mountain Fuel Supply Co., Salt Lake City.—Has temporary FPC permit to build 38 miles of line to connect with Pacific Northwest Pipeline Corp.'s system in Sweetwater County, Wyoming.

• **Natural Gas Pipeline Co. of America.**—Has FPC approval for 350 miles of 20 and 26-in. from Jack and Wise counties, Texas, to Fritch, Tex., which will be contested by Natural Gas Pipeline and Lone Star Gas Co. Filed for FPC permit for a 389-mile, 36-in. loop along its line from Beatrice, Neb., to Chicago, to take gas from proposed line of Colorado Interstate Gas Co. Also for 91 miles of 30-in. looping to be laid along parts of its main line.

New York State Natural Gas Corp.—Williams-Austin Co. has 17 miles of 30-in. from Caton to Horseheads, Steuben County, New York, starting August 1, to complete November 1, 1956.

Niagara Mohawk Power Corp.—Let to various contractors, 275 miles of 2 to 12-in. distribution mains for growth of service areas in Central, Eastern, and Northern New York, to be completed December 31, 1956.

• **North Carolina Natural Gas Corp.**—This subsidiary of Colonial Natural Gas Corp. has permit from North Carolina Utilities Commission for 575 miles of 3 to 16-in. from Transcontinental Gas Pipe Line Corp.'s system near Mooresville, eastwardly across North Carolina.

• **Northern Natural Gas Co.**—Applied to FPC to add 348 miles of main line, 307 miles of branch lines in Wisconsin, Minnesota, South Dakota, and Iowa. Main lines include 169 miles in Duluth-Superior area, 164 miles in Aberdeen area of South Dakota.

R. H. Fulton & Co. has 28 miles of 20-in. from Redfield to Ogden, Iowa; Beaver Creek and North Racoon crossings; 15 miles of 24-in. north and south of Hooper, Nebraska.

Pentzien, Inc., has 24-in. Elkhorn River crossing.

Plans 73 miles of 20-in., Savanna Creek to Pincher Creek fields in Alta., Canada; 32 miles of 24-in. from Pincher Creek to Montana border; 1,100 miles of 26-in. from Montana into Minneapolis.

• **Offshore Gathering Corp., Houston.**—Seeks FPC permit for 364 miles in Gulf of Mexico off Louisiana: 60 miles of 24-in.; 70 miles of 26-in.; 234 miles of 30-in.

• **Pacific Gas & Electric Co.**—Will build 37 miles of 20-in., 37 miles of 18-in., 9 miles of 12-in. from Beehive Bend field near Willows, Calif., to near Davis, then to Sacramento. Has under way a 6-mile gathering system at Beehive Bend. Also plans to loop the Topock-Milpitas line with 135 miles of 34-in., laying major part in 1956, and 62 miles in 1957. A joint-venture firm, Midwestern-Johnson-Dixon, has 85 miles of this to complete in 1956.

• **Pacific Northwest Pipeline Corp.**—Has FPC permit for 37 miles of 6-in. from Dove Creek, Colo., to Nucla, and 13 miles of 4-in. from Nucla to Uravan, to serve Union Carbide Nuclear Co. and Vanadium Corp. of America. Work under way on other trunk and sales laterals:

R. H. Fulton & Co., 156 miles 20 and 16-in. lateral from main line to Spokane; also 129 miles of laterals into Idaho, to complete fall 1956.

• **Permian Basin Pipeline Co.**—R. H. Fulton & Co. has 19 miles of 16-in. in Andrews County, Texas.

• **Phillips Chemical Co.**—Plans 79 miles of 6-4-in. ethylene line from Sweeny to Pasadena, Tex., to be completed December 31, 1956.

• **Piedmont Gas Co., Hickory, N. C.**—(Parent is Carolina Natural Gas Corp.) Seeks FPC permit for 78 miles of 2 to 8-in. extension off Transcontinental in North Carolina, to serve Gaston, Lincoln, Catawba, Caldwell, and Burke counties.

Portland Gas & Coke Co.—United Engi-

H&M MODEL "30"

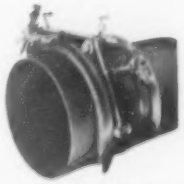
You're "paying for the butcher's thumb" when you use *oversized equipment* on 30" pipe cutting and beveling operations! — because H&M Model "30" is designed *specifically* for the 26" to 30" range of pipe — *at lower cost.*

The increasingly widespread use of 30" pipe on gas transmission lines demands specialized equipment for greater savings, more speed and efficiency.

So, H&M now offers its Model "30", built on the same split-gear principle as all H&M machines, and with the same lightweight but rugged construction, with same ease of operation and economy in both field and shop.

WRITE FOR ILLUSTRATED BULLETINS ON THE COMPLETE H & M LINE

- PIPE CUTTING & BEVELING MACHINES From 1½" to 36"
- SHAPE CUTTER
- OUT-OF-ROUND
- FLEXIBLE SHAFT
- MOTORIZED UNITS



PAT. PENDING

LIGHT AS A FEATHER

H&M

T M REG

PIPE BEVELING MACHINE CO.

311 E. THIRD ST. • TULSA • Diamond 3-0241

Pipeline Patrol

neers & Constructors, Inc., of Philadelphia, has engineering contract for 80 miles of various size lines up to 16-in.

Reynolds Sales Co.—Collins Construction Co. has 20 miles of 10-in. in Corpus Christi Bay and Oso Bay, F. T. Glascock, project manager, Fred Wakefield, general supt., office at Gregory, Tex.

Signal Oil & Gas Co.—C. P. Bartley & Son has 70 miles of 2 to 16-in. gathering system near Tioga, N. D., to be completed September 1, 1956. C. P. Bartley, Jr., and Lawrence Barto, spread men, office at Tioga.

• **Southern California Gas Co. and Southern Counties Gas Co. of California.**—Have permit for 239 miles of 30-in. from Topock, Ariz., to Newhall, Calif., to start November 1956, to complete 1957.

Also building 49 miles of 30-in. from Newhall to Alhambra, Calif. Work is under way by: Alex Robertson Co., 13 miles; Macco Corp., 16 miles; Joe E. Young Contractors, Inc., 19 miles. To be completed December 1, 1956.

• **Southern Natural Gas Co.**—Has temporary FPC authority for 39 miles of loops near Atlanta, Ga.

• **Tennessee Gas Transmission Co.**—1—Bechtel Corp. has 74 miles of 30-in. looping from Glasgow to Danville, Ky., to complete by October 1, 1956, Joe L. Work, spread man, office at Greensburg, Ky.

2—142 miles of 26-in. looping in Ohio, to be completed fall 1956, under contract to: H. C. Price, 81 miles from near New Boston to near McConnelsville, G. A. Reutzel, spread man, office at Chauncey (30 miles completed); Oklahoma Construction Co., 61 miles from near Newcomerstown to near Lisbon, office at Carrollton, Gene Gohring, spread man (30 miles completed).

3—Has FPC permit for 63 miles of 30-in. looping from Scottsville, Ky., to Cave City, and from southwest of Danville to northeast of Danville.

4—Has FPC permit for 99 miles of 26-in. looping from Greenup, Ky., to north of Ohio River, from McConnellsville to Newcomerstown, and from Lisbon, Ohio, to near Mercer, Pa.

5—Seeks FPC permit for 100 miles of 4, 6, 8, 10, and 12-in. gathering line in Texas-Louisiana Gulf Coast area.

• **Texas Eastern Transmission Co.**—Applied to FPC, December 1955, for 422-miles of 30-in. from McAllen to Beaumont, Tex., to move imported Mexican gas. Applied for 530 miles of 30-in. looping from Kosciusko, Miss., to Uniontown, Pa. Will lay 45 miles of 24-in. from Provident City, Tex., to connect in Matagorda County, Texas, to tie the Wilcox Trend Gathering System with the extension from Mexico.

Texas Gas Transmission Corp.—Houston Contracting Co. has 195 miles of work in Miss., Ark., and Southern La.: 22 miles of 30-in. and 10 miles of 18-in. reconditioning near Clarksdale, Miss., started August 1, W. H. Hayes, supt.; 31 miles of 30-in. and 10 miles of 18-in. reconditioning near Greenville, Miss., and Wilmot, Ark., started August 5, F. A. Silar, supt.; 122 miles of 20-in. to lay from Eunice, La., to East of Morgan City, La.; M. L. Thompson, supt.

Pentzien, Inc., has Mississippi River crossing near Greenville, Miss., to complete December 15, 1956.

• **Texas Eastern Transmission Corp.**—Has FPC approval to build 11 miles of 12-in. in Philadelphia area.

• **Trans Carolina Pipe Line Corp., Commercial Building, Raleigh, N. Car.**—Seeks FPC permit for 300-mile system across North and South Carolina, plus 500 miles of laterals.

• **Transcontinental Gas Pipe Line Corp.**—Has applied to FPC to lay 160 miles of 36-in., 67 miles of 30-in., and 24 miles of 24-in. loops from Louisiana to Pennsylvania, to be completed December 1, 1956; 25 miles of 36-in. loops from Louisiana to South Carolina, to lay in 1957.

• **Washington Gas Light Co.**—Has FPC approval to construct 26.1 miles of 24-in. and 2.7 miles of 20-in., from Dranesville, Va., to Washington, D. C.

Winchester and Vienna, Ill., Cities of—M. L. Hulcher Co., Inc., has 21 miles of 8-in. for Winchester, to complete September 30, 1956, Rolfe, superintendent.

Foreign Crude-Oil Pipelines

Arabian American Oil Co.—Firm is building a 140-mile, 20-in. line from Safaniya field to Ras Tanura.

• **Canadian Gulf Oil Co.**—Seeks approval for 35 miles of 8-in. to connect Drumheli field, Alberta, with existing Gulf lines running to Edmonton.

Cremona Pipe Lines, Ltd.—Dutton-Williams Brothers, Ltd., has 78-mile, 8-in. line from Sundre-Westward Ho region to Calgary, to be completed August 1956. Company is subsidiary of Home Oil Co. Spread office is in Calgary, and F. Peters is spread man.

Gulf Italia Co.—Will complete late summer 1956, 35 miles from its Ragusa field in southwestern Sicily to RASIOM's refinery at Augusta.

Interprovincial Pipe Line Co.—Majestic Contractors, Ltd., has under way 67 miles of 24-in. between Carroll and Somerset, Man.; 2 miles of 26-in. between U. S. border and Gretna pumping station, to complete August 31, 1956.

AN-SPEC

HIGHEST QUALITY MATERIALS

- COMPREHENSIVE SURVEYING
- EXPERIENCED ENGINEERING
- COMPLETE CONSTRUCTION

AN-SPEC magnesium anodes are spectrographically analyzed . . . high purity guaranteed. And Pipe Line Anode Corporation offers every service — by highly skilled personnel — for the most effective results. For complete cathodic protection from corrosion, call . . . AN-SPEC.

ANODE SPECIALISTS
AN-SPEC

PIPE LINE ANODE CORPORATION

P. O. BOX 996 • TULSA, OKLAHOMA

2230 Magnolia Street, Birmingham, Alabama
11525 East Colfax, Denver (Aurora), Colorado
898 Wilson Avenue, Newark, New Jersey
912 West 11th, Houston, Texas

Distributor: Crose-Curran, Ltd., Edmonton, Alberta—Phone 3-5135

Pipeline Patrol

Has applied to Board of Transport Commissioners for 151 miles of 20-in., an extension of its line from Sarnia to Port Credit, Ont. If approved, work will start spring 1957, end that fall.

• **Mene Grande Oil Co.**—Plans 11 miles of 6-in. from Elias to Fria, and 10 miles of 10-in. from Limon to Leona-Dacion Lateral, Venezuela, to complete first quarter 1957; 24 miles of 12, 14, 16-in. from Oficina Tank Farm to Oveja, to complete in 1956.

Peace River Oil Pipe Lines, Ltd.—Fulton Banister, Ltd., has contract to coat and bury 45 miles of 12 and 16-in. from Valleyview to Edson, Alta. (Line was welded above ground last year). Jerry Nash is superintendent, office at Valleyview.

Pembina Pipe Line, Ltd.—Sparling Davis Co., Ltd., has 100 miles of 3 to 10-in. gathering system in Pembina field.

Mannix, Ltd., has 200 miles of 3 to 12-in. gathering lines in Pembina field, F. Whitlow, superintendent, office in Pembina field.

PEMEX.—Constructora El Aguila, S. A., has 50 miles of 20-in. from Angostura to Veracruz, Antonio Sanz Polo, spread man, office at Veracruz.

• **Rangeland Pipeline, Ltd.**—Will build 17 miles of 6-in. and 16 miles of 4-in. from west end of Joffre field to connect West Gilby; 10 miles of 12-in. from Gilby Junction to Rimbey field, Alberta. Work to be completed fall 1956.

• **Royal Dutch-Shell**—Together with several other companies, is considering 700-mile line across Europe from the Mediterranean to the North Sea, running through Eastern France, Luxembourg, West Germany, the Netherlands, and Belgium. Main trunk would be 30-in.

• **Sinclair Oil Corp. and Socony Mobil Oil Co.**—Will build 211 miles of 20-in. from the Silvestre field in Barinas, Venezuela, to Puerto Cabello on Caribbean Sea.

• **South Saskatchewn Pipe Line Co.**—Building 58 miles of 12-in. from Cantuar field to Dollard field in Saskatchewan, to be completed September 1956.

• **Texaco Exploration Co.**—Plans 22 miles of 12-in. and 3 miles of 8-in. between Westerose and Rimbey pools, Alberta, Can.

Union of Soviet Socialist Republic.—Has under way a 2,300-mile Trans-Siberian crude and products system from Ufa and the Tuimaza fields in Bashkiria to Irkutsk near Lake Baikal.

Westspur Pipe Line Co.—Majestic Contractors, Ltd., has 109 miles of 12-in. from Midale, Sask., to Interprovincial Pipe Line Co.'s pump station at Cromer, Man., and 50 miles of various size gathering lines in Midale-Frobisher area, to complete fall 1956.

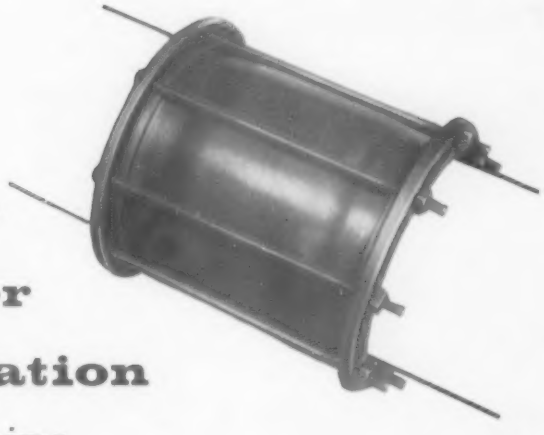
Yacimientos Petroliferos Fiscales (Argentina).—Has started 700 miles of 12-in. from Campo Duran to San Lorenzo. TECHINT, (Compania Tecnica Internacional), Buenos Aires, has 90 miles.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 160 miles of 10-in. and 43 miles of 8-in. from Sicasica to Arica on the Chilean coast, to be completed December 1957.

Foreign Products Pipelines

• **Estrada de Ferro Santos a Jundial Departamento Oleoducto.**—Plans 6 miles of 14-in. from the Capuava Refinery to Utinga Terminal, to be completed December 1956.

Hydrocarbons Pipeline Co. (subsidiary of Canadian Hydrocarbons)—Has permit from Parliament of Canada to build 800 miles of 6 and 8-in. L.P.G. line from near Edmonton, Alta., to Ft. William, Ont. If approved by Federal Board of Transport Commissioners and the Alberta Petroleum and Natural Gas



for faster installation join pipe

THE DRESSER WAY!

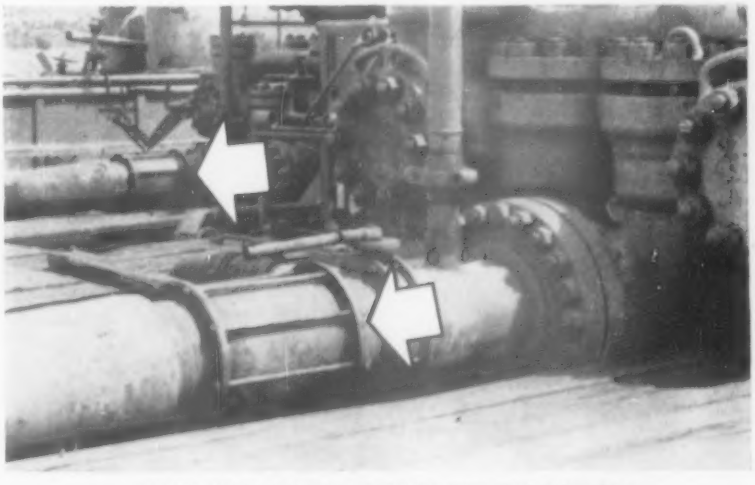
You'll find plenty of uses for Dresser Couplings and Long Sleeves around a drilling rig . . . or anywhere else you join pipe.

That's because Dresser Long Sleeves make pipe joining so quick and easy. Pipe threading is eliminated. You simply slip on the sleeve and tighten with a wrench. Perfect alignment of pipe sections is unnecessary because the specially compounded rubber gasket permits up to 4° deflection at joints.

You get a permanent, bottle-tight connection every time—one that has the "give and take" necessary to absorb vibration, settlement and other stresses.

DRESSER®

Dresser Manufacturing Division • Bradford, Pa.



AVAILABLE AT ALL LEADING OILFIELD SUPPLY STORES IN THE UNITED STATES AND CANADA

Style 38 Coupling

Style 40 Long Sleeve

Hydrepair® Asbestos Cement Pipe Clamp

Style 63 Expansion Joint

Style 39 Insulating Coupling

Pipeline Patrol

Conservation Board, work will start early 1957. Williams Brothers, Calgary, and A. D. Little and Co., Boston will act as construction consultants.

• **Imperial Oil, Ltd.**—Will lay 38 miles of 12-in. loop along present line from Waterdown, Ont., to Toronto.

• **Iraq Petroleum Co., Ltd.**—Plans 75 miles of 24-in., 180,000-bbl. daily capacity, from Homs, Syria, to Tripoli, Lebanon.

National Iranian Oil Co.—Contracts let on 573 miles of 10-in., 40,000-bbl. daily capacity, from Ahwaz to Teheran, Iran; Constain-John Brown, Ltd., London, and Williams Brothers Co., started February 1956, laying southern 337 miles; Enterpose of Paris, has northern 236 miles.

• **North Atlantic Treaty Organization (NATO).**—Laying 2,000 miles of lines to airfields in parts of Europe. Associated Pipeline Contractors, Inc., has 450 miles from Iskenderun, Turkey, to Batman. TECHINT (Compagnia Tecnica Internazionale), Milano, Italy, has 205 miles of 4-in. from Bandirma to Eskisehir, Turkey, and 250 miles of 8-in. from Antalya to Eskisehir. Bids were taken in January 1956, on 300 miles of 12-in. between Marseille and Langres, France.

PEMEX.—Constructora El Aguila, S. A., has 155 miles of 12-in. from Tampico to Cd. Victoria. Geronimo Aviuchastegui, spread man, office at Tampico.

The United States Defense Department.—Sponsoring 485 miles of 8, 10, 12-in. from Cadiz to Zaragoza, Spain. Contracts let to Merritt Chapman & Scott; Benson & Montin of Oklahoma City; Agroman Construction Co. of Spain. Prime contractor is Brown-Raymond-Walsh.

Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)—Williams Brothers Co. has 190 miles of 4-in. from Camiri to Santa Cruz, to be completed December 1956.

Foreign Natural-Gas Pipelines

• **Alberta Gas Trunk Line Co.**—Plans 547 miles of gathering system for the Trans-Canada line. About 40 miles of 34-in. will be laid in 1956 to connect Bindloss field. Remainder to be laid in 1957 and 1958. Fields to be connected are Pincher Junction, Provost, Sibbald, Oyen, Sunnynook, Steveville, Cessford, Countess, Dutchess, Princess, Homeglenn, Rimbey, Nevis.

Andes Pipeline Corp.—This subsidiary of Glenn McCarthy, Inc., will build and operate 500 miles of 12-in. from McCarthy's Bolivian concession to the Chile copper mining area.

Attock Oil Co.—Plans 60 miles from Dhulian field to Rawalpindi in West Pakistan.

B. C. Electric Co., Ltd.—Mannix, Ltd., has 10 miles of 18-in. and 20-in. in vicinity of New Westminster, B. C. to complete in October 1956. D. Graham, 546 Howe Street, New Westminster, is spread man.

• **Magna Pipeline Co.**—Plans to complete fall 1956, an underwater line from Anacortes or Bellingham, Wash., to Victoria.

PEMEX—Plans starting July 1956, on 22-in. line between Reynosa and Monterrey.

• **Rangeland Pipeline Co.**—Has let contract for 44 miles of 4-in., 6-in., and 12-in., from Red Deer to Rimbey, Alta., to Dutton-Williams Brothers, Ltd., for October 1956 completion.

Saskatchewan Power Corp.—Fulton Banister, Ltd., has 229 miles in Saskatchewan, Jerry Nash, general superintendent: 115 miles of 12-in. from Success to Moose Jaw, starting July 15, to complete September 1, 1956, office at Swift Current; 53 miles of 6-in. from Biggar to North Battleford and 30 miles of 8-in. from Dana to Humboldt, completed; 17 miles of 10-in., 8 miles of 6-in., and 6 miles of 4-in. Hoosier extension and gathering lines from Brock field to Eston Transmission lines, to complete October 1, 1956, office at Kindersley.

South Alberta Pipe Line, Ltd.—Filed permit for 150 miles of 8-in. from Etzikom field to serve a nitrochemical plant to be built near Medicine Hat, Alta.

• **Trans-Canada Pipe Lines, Ltd.**—Work begins July 1, 1956, on 574 miles of 34-in. from the Alberta-Saskatchewan border to Winnipeg. Contracts let on first four sections to: Majestic Contractors, Ltd.; Canadian Bechtel, Ltd.; Mannix Ltd.; Dutton-Williams Brothers, Ltd. Three sections still to be let. Completion of this stretch planned for December 1, 1956. This is the first stretch of a 2,250-mile line from Alberta to Toronto and Montreal. Deadline for exporting gas from Alberta is December 31, 1957. Tennessee Gas Transmission Co. has proposed a line to take the gas at Emerson, Man. (See Midwestern Gas Transmission Co.).

Westcoast Transmission Co., Ltd.—Has let 650 miles of 30-in. from Peace River area, Canada, to Sumas, Wash. Dutton-Williams Brothers, Ltd., has 120 miles from Taylor, B. C., to Azouzetta Lake, to be completed September 1957, O. Graves, spread man, office at Dawson Creek, B. C.

Mannix, Ltd., has 110 miles between Huntingdon and Merritt, Fred Byers, superintendent, office at Chilliwack.

Canadian Bechtel, Ltd., construction division, has 210 miles from Alexandria to Pine Pass, B. C. to complete September 15, 1957, H. F. (Hank) Mogg, spread man, office at Quesnel, B. C.

do it with Air-Cooled
WISCONSIN ENGINE POWER

Salt Water Disposal Pump

Trailer-mounted Pumping Unit

Pipeline Dirt Padding Machine

Pipeline Gathering Pump

When water boils away under a scorching summer sun . . . if the temperature should go up to an unbelievable and unbearable 140° F. — or if, on the other hand, it should drop to minimums way below the freezing point during an unseasonal cold spell — *there would be no cause for concern if your equipment is powered by a Wisconsin Heavy-Duty AIR-COOLED Engine!*

Wisconsin Engine AIR-COOLING is entirely automatic and as trouble-free as modern engineering ingenuity can make it. Every Wisconsin Engine from the smallest to the largest is equipped with a large capacity blower, integrally cast as a part of the flywheel. A powerful blast of AIR is continuously distributed over the closely-finned cylinder heads and walls by means of scientifically designed and placed air shrouding, providing correct heat dissipation at all temperatures up to 140° F.

In addition Wisconsin basic High Torque design and heavy-duty construction are assurance of steady-going operating dependability, low-cost maintenance and efficient, economical performance. All models can be equipped with electric starter and generator, or starter only, as original equipment.

There is no more rugged engine built, in a 3 to 36 hp. range, than a Wisconsin "AIR-COOLED" — which is a good reason why YOU should specify Wisconsin Power for your equipment. Write for "Spec" bulletin S-188.

WISCONSIN MOTOR Corporation
MILWAUKEE 46, WISCONSIN
World's Largest Builders of Heavy-Duty Air-Cooled Engines

WRITE TO HARLEY SALES CO.
419 SOUTH MAIN STREET • TULSA, OKLAHOMA
3420 McKINNEY AVENUE • HOUSTON, TEXAS
309 SOUTH MAIN STREET • WICHITA, KANSAS
OIL FIELD DISTRIBUTORS FOR WISCONSIN ENGINES AND ALL TYPES OF UTILITY UNITS

A 8012-½-I

PETRECO®

For nearly half a century Petreco has concentrated on the design, development, construction and servicing of electric processing equipment designed to help the petroleum industry. From this program has evolved the following Petreco electric petroleum treating equipment:

Crude Oil Dehydrators
Crude Oil Desalters
Sediment Separators
Distillate Electrofiners
Lube Oil Electrofiners
Doctor Treating Electrofiners

These processing units, currently used throughout the oil producing and refining world, are applicable to problems involving demulsification, sediment removal, salt removal, arsenic removal, nitrogen base removal and other types of distillate treating. For complete information, write or call

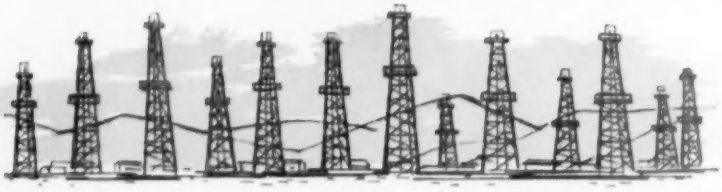
PETRECO®

A DIVISION OF PETROLITE CORPORATION

3202 So. Wayside Drive, Houston 1, Texas
1390 E. Burnett Street, Long Beach 6, California

LEADER IN ELECTRIC PROCESSING PROGRESS

"Nothing Beats a Globe for DURABILITY"



Quality is the reason

Here's the biggest bundle of high-powered digging performance ever offered an ambitious tool pusher. The best in design, engineering, materials, and manufacturing precision, gives you *faster, deeper hole for your money!*

GLOBE TYPE "SS3C"
Integral Jet Rock Bits

GLOBE
OIL TOOLS COMPANY

Serving the Petroleum Industry
with the Best in Drilling Equipment

Main Office and Plant:
LOS NIETOS, CALIFORNIA
Branches are maintained in all principal drilling areas.

Among the

Drilling Contractors

Blanton Drilling Co., Houston, is drilling for Russell Maguire at a wildcat location 1½ miles southwest of Kemah, 30 miles southeast of Houston, in Galveston County, Texas Gulf Coast. Location, at 2 Taylor, in the Rafael Basquez Survey, is 3 miles north of Dickinson field, nearest production.

Nowery Drilling Co., Shreveport, has a new wildcat operation under way in Shelby County, eastern Texas. It is a contract job for Gulf Oil Corp. and V. P. Grace at 1 Johnson. Location is in the James Alford Survey, about 3¾ miles northwest of Center. Plans call for a 7,300-ft. test.

D. Thomason Drilling Co., Shreveport, is on a new 7,400-ft. well Skelly Oil Co. is putting down in the Carthage area, Panola County, East Texas. Location is a mile southeast of Tatum. It is on Skelly's R. E. Young lease, in the H. James Reel Survey.

Armstrong-Fowler, Inc., has the drilling contract on a wildcat operation Ken-Cal Oil Co., of Fillmore, Calif., is starting 2½ miles southeast of Fillmore, in Ventura County, near the Los Angeles County line, in southern California. The test is listed as 1 Calumet, with location in 34-4-19. It is scheduled to go to 6,000 ft. Location is north of Shiells Canyon field.

Clyde Hall Drilling Co., Bakersfield, Calif., has a rig working for Union Oil Co. in the Arvin area, southeast of Bakersfield, in Kern County, southern California. It is on a wildcat location 2½ miles west of town on Union's Stenderup lease, in 21-31-29. Hole will be carried to 11,000 ft.

Fleet Drilling Co., Ada., Okla., has the contract on a new Bois d'Arc (Hunton) test Continental Oil Co. is drilling on its block adjacent Oklahoma City's Will Rogers airport, southwest of the city, in southwestern Oklahoma County, Oklahoma. The location, 1 Todd, in 19-11n-4w, is a wildcat northwest of Short Junction field. Objective is expected about 8,200 ft.

Delta Gulf Drilling Co., Tyler, Tex., will join **Penrod Drilling Co.,** Shreveport, in drilling for California Co. in the new Kenner area, in St. Charles Parish, South Louisiana. Delta Gulf will drill 1 State Lease 2359, the operator's third test. Penrod is on the sec-

Loffland Brothers Co. rig on highest location ever drilled in Canada. It is working for Phillips Petroleum Co. and Husky Oil & Refining, Ltd., at Savanna Creek, on Plateau Mountain, in southwestern Alberta Province. Current highest location is at 3-A Savanna Creek with elevation (kelly bushing) at 8,149 ft. It is drilling below 7,000 ft. (See story on page 149).

STOP LEAKS

It is not easy to keep casing and tubing from leaking, especially in deep, high-pressure wells. The high percentage of metallic lead in 'Bestolife Lead Seal actually provides a plastic lead gasket for threads as joints are made up. That's why joints made up with 'Bestolife won't leak, strongly resist corrosion, and can easily be broken out—even years later. Your local supply store stocks 'Bestolife in 1¼, 5, 20 & 50 lb. cans. Unconditionally guaranteed.

I. H. GRANCELL
1601 EAST NADEAU STREET
LOS ANGELES 1, CALIFORNIA

PETROMEC

FLEX-LIP PIPE WIPERS
FLEX-STRIP TUBING STRIPPERS
FLEX-TIP API
RING-JOINT GASKETS
SAND SENTINELS
WEAR GUARDS

PETROLEUM MECHANICAL DEVELOPMENT CO.
7623 KATY ROAD
UNderwood 9-2671
HOUSTON 24, TEXAS

WESTERN CANADA DISTRIBUTOR
EDECO CANADA LIMITED
10103 80th AVENUE TELEPHONE 35825
EDMONTON, ALBERTA

Always tops in Quality-now
IMPROVED
to meet the demands of faster, deeper drilling!

Used Exclusively On World's Deepest Well In Louisiana!

Sold through your favorite supply store

MONEY BACK GUARANTEE

USE JIMMIE GRAY DOPE BRUSHES

PETROLEUM DISTRIBUTING COMPANY

BOX 203 - HOUSTON, TEXAS - CApitol 4-9648

ond test, 2 Calico-Cities Service, now nearing completion with bottom of the hole at 10,360 ft. California Co.'s discovery well was completed last February with gas-condensate production from pay at 8,266-78 ft. It was drilled to 11,000 ft.

Drilling & Exploration Co., Inc., Houston, is scheduled for a deep test at a wildcat location 4 miles southwest of Opelousas, in St. Landry Parish, South Louisiana. It is a contract job for Olin Oil & Gas Corp. Location, in 28-6s-3e, is 2½ miles north of production in Lewisburg field. Contract calls for an 11,500-ft. test.

Atlas Drilling Co. has a new operation scheduled for Austral Oil Exploration Co., Inc., at Anse La Buttte, on the Lafayette-St. Martin parish line, Louisiana Gulf Coast. It will be an 11,000-ft. outpost test off the west flank of the dome. Location, at 1-B Nickerson, in 11-9s-5e, is on the Lafayette parish side of the line.

Coastal Drilling Co., Los Angeles, is well along on the deep exploratory test it is putting down for The Texas Co. in the Tejon Ranch area southeast of Bakersfield, in Kern County, southern California. The test, 1 CWOD (NCT-1), in 32-11-19, is projected to 12,000 ft. as an Eocene test. Location is a half mile south of a 13,239-ft. test (deepest for the area) drilled by Standard Oil Co. of California, and nearly a mile from production.

Buster Gardner is contractor on a deep wildcat test F. A. Callery, Inc., and Natural Gas & Oil Co. are undertaking in the Coquille Bay area, in the delta marshes bordering Breton Sound, in Plaquemines Parish, Louisiana Gulf Coast. Location is on State Lease 2792. Hole is to be carried to 12,300 ft.

Grey Wolf Drilling Co., Houston, has a new contract job in Avoyelles Parish, southern Louisiana. It is an 8,800-ft. Wilcox test for Gulf Coast Leaseholds, Inc., at a wildcat location a mile south of production at Dave Haas field. It is carried as 1 L. O. Campbell, Jr., with spot location in 18-2s-3e.

Flourney Drilling Co., Alice, Tex., an operating partner with Keemac Lease Service in a 6,500-ft. wildcat test 19 miles southwest of Freer, in western Duval County, Southwest Texas. Flourney is drilling the test as a contract job. Location is for 1-A Saenz, in the A. Lopez Survey. It is only 890 ft. from the Webb county line.

NOW BUYS MUDWONDER

S. T. "Buck" Dotson of Big Chief Drilling Co. now buys Mudwonder Mudline Valves for less maintenance.

Edward Valves, Inc., Subsidiary of Rockwell Manufacturing Company, East Chicago, Ind.

BrakeSol

ELIMINATES COSTLY PARAFFIN REMOVAL METHODS

HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

BRAKESOL is economical and safe to use, prevents and removes paraffin from the tubing, flow lines, tank bottoms and pipe lines. Effective on both asphalt and mixed-base paraffin.

FOR SERVICE CONTACT YOUR NEAREST BRAKESOL SALES ENGINEER

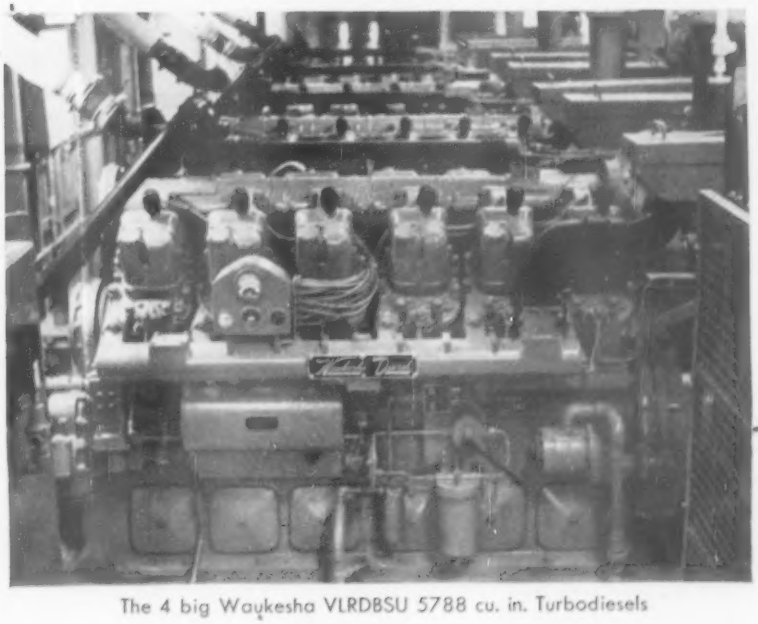
—EXPORT DISTRIBUTOR— The National Supply Co. Export Division

CARMI, ILLINOIS 4-2905
CASPER, WYOMING 2-3453
ELLINWOOD, KANSAS 537-R
FT. MORGAN, COLO. UNderhill 7-5981
HOUSTON, TEXAS HOmestead 5-6648
LOVINGTON, NEW MEXICO 6-5954
NEW IBERIA, LOUISIANA EMerson 9-3498
ODESSA, TEXAS 7-7192
2-2575
OKLAHOMA CITY, OKLA. VI 3-6629 WH 9-5561

BRAKESOL, Inc.
P.O. Box 9506 Okla. City, Okla.

4 Big WAUKESHA V-12 *Turbodiesels*

Power this NEW OFFSHORE DRILL RIG



The 4 big Waukesha VLRDBSU 5788 cu. in. Turbodiesels

● This elevated deck offshore barge was built for the California Co. by Avondale Shipyard; drilling equipment and operation by the Noble Drilling Corporation. Oil men who have seen this remarkable equipment were much impressed by the array of big Waukesha Turbodiesels which are the prime source of power.

WAUKESHA MOTOR COMPANY
WAUKESHA, WISCONSIN
New York • Tulsa • Los Angeles
319

this *new* CARDWELL

* P.T.O. Driven
* Trailer Mounted
* Truck Mounted

What do YOU need in a servicing hoist . . . fast operating speeds . . . minimum weight without sacrificing strength . . . greatest versatility in mounting . . . rugged, yet precision construction?

Then, this Model K-200 Series fits your every requirement. These 7,000 to 9,000-foot single or double drum hoists are the result of 30 years' experience building servicing equipment that best meets the industry's specifications.

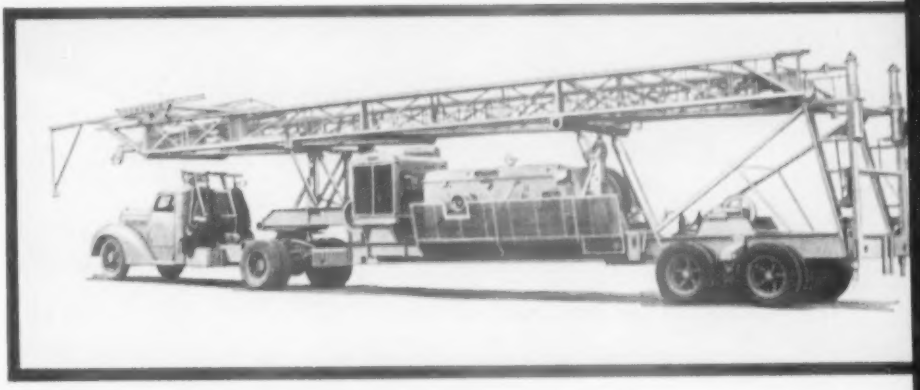
Write for complete information and prices on a hoist to fit your needs, or see your nearest Cardwell representative.

Here are the Cardwell design features that mean *Top Performance:* convenient air controls, air-friction-clutch driven throughout, including drum drives, and water-cooled braking system. Optional equipment: rotary drive assembly, and single or double leg masts or tubular steel masts.

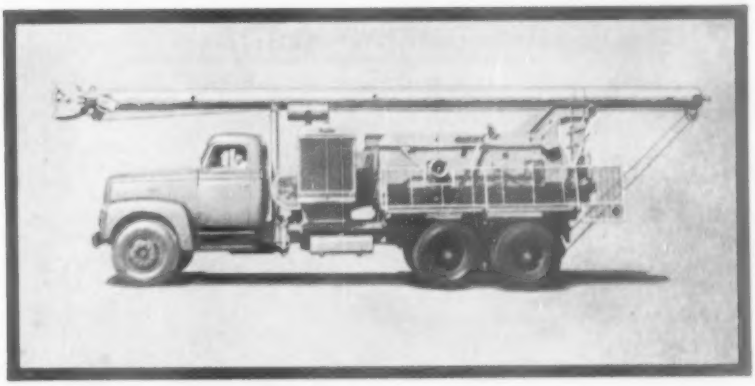
CARDWELL

Hoist will fit your every need

Power take-off K-201 holds axle loads to a minimum.



K-200 with 89-foot, 150,000 lb. capacity "Trailermast". Easy to transport and rig-up.



Truck-mounted K-200 is available with engines up to 230 H.P. to give maximum power and operating speeds.

CARDWELL MANUFACTURING COMPANY • Box 2001, Wichita, Kansas, U. S. A.

1. **Wear Groove** enables user to tell at a glance when it is time to change the piston body.
2. **Close tolerance** machining means longer wear.
3. **Induction hardened flange** reduces the rate of wear and provides longer life.
4. **Specially treated surface** prevents galling and assures longer wear for both piston and liner.

These four features of Mission Piston Bodies mean longer life for both pistons and liners – resulting in less shut-down time and lower costs. Mission Pistons are guaranteed to be the most economical on the market and Mission Liners are made to help Mission Pistons last longer. Be sure to install both. They are available through all supply stores.

Nothing but the finest will bear the name of MISSION MANUFACTURING CO.

MISSION MANUFACTURING CO. • P. O. Box 4209 • Houston, Texas • Cable Address—"Missco" • Export Office: 30 Rockefeller Plaza, New York
In The United Kingdom: MISSION MANUFACTURING CO., LTD. • 17 Hanover Square • London, W. 1. England • Cable Address—"Missoman"

Slush Pump Valves • Valve Springs • Valve Seat Pullers • Pistons • Piston Rods
Liners • Gland Packings • Slips • Swabs • Centrifugal Pumps • Plug Valves

PESA

the OIL AND GAS JOURNAL

Showcase

OF NEW EQUIPMENT AND LITERATURE

by Dan B. Miller

AC-1 Prevents Gum, Sludge In Petroleum Products

Preventing harmful oxidation in petroleum products, rubber, and plastics, antioxidant AC-1 is an alkylated cresol. AC-1 prevents oxidation of components in high-octane gasoline into gums and peroxides. The gums build up into objectionable deposits on engine parts, while the peroxides lead to a depreciation of the gasoline's antiknock qualities.

AC-1 also prevents the formation of a sludge in motor and other lubricating oils, the development of odor or discoloration in waxes, and the decomposition and discoloration of rubber products. The antioxidant prevents embrittlement and discoloration in polystyrene, vinyl films, and polyethylene. **For more information write or call: Catalin Corp. or America, 1 Park Avenue, New York 16, N. Y.**

•

Device Seals Pressures Up to 10,000 Psi.

The Dyna-seal is a new sealing device that is adaptable to sealing under bolt heads and such abutment flanges as a pipe union or similar flanges which require sealing between two faces with the bore open to pressure.

The Dyna-seal consists of an inner-sealing member made of Hycar American rubber, heat and pressure bonded to an outer confining steel ring or washer. The device supplies a positive lock-washer action and effectively seals pressures up to 10,000 psi. against air, water, all types of petroleum products, and many gases and chemicals. The seals function in a temperature-service range from —65° to 250° F.

Dyna-seal reuse is possible, offering an economy of time and material. Initial cost is low, and the seals are easily installed. Dyna-seals are manufactured in sizes ranging from ⅛ to 1¼ in. **For more information write or call: B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio.**

Tank Cools Oil for Hydraulic Pumping

An air-cooled, ducted reservoir tank is designed for installation on Axelson hydraulic pumping units with 6 and 10-ft. strokes. In hot climates and under conditions where the temperature of the hydraulic oil would be high, the Axelson ducted tank is a necessary accessory. It prevents the breakdown of the oil and the overheating of precision components in hydraulic pumping units. The tank holds approximately 150 gal. and is furnished with or without the blower and return vent. The blower is used to force high-velocity air through and over the ducted tank, thus providing the maximum amount of cooling. **For more information write or call: Axelson Manufacturing Co., Division of U. S. Industries, Inc., 6160 South Boyle Avenue, Los Angeles 58, Calif.**

•

Sentry Valve Line Includes Latch and Piston Types

Widely used in the petroleum, gas, and chemical industries, the Sentry line of valves includes two types. The latch-type valve is used for automatic closing of gas and fuel lines. The pis-

---

the OIL AND GAS JOURNAL **Showcase Coupon**

USE THIS FORM TO OBTAIN INFORMATION ON ITEM DESCRIBED HERE

MANUFACTURER _____

ADDRESS _____

CITY _____ STATE _____

Please send me complete information on the following item

_____

_____

Described in the Aug. 20, 1956, issue of The Oil and Gas Journal

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____

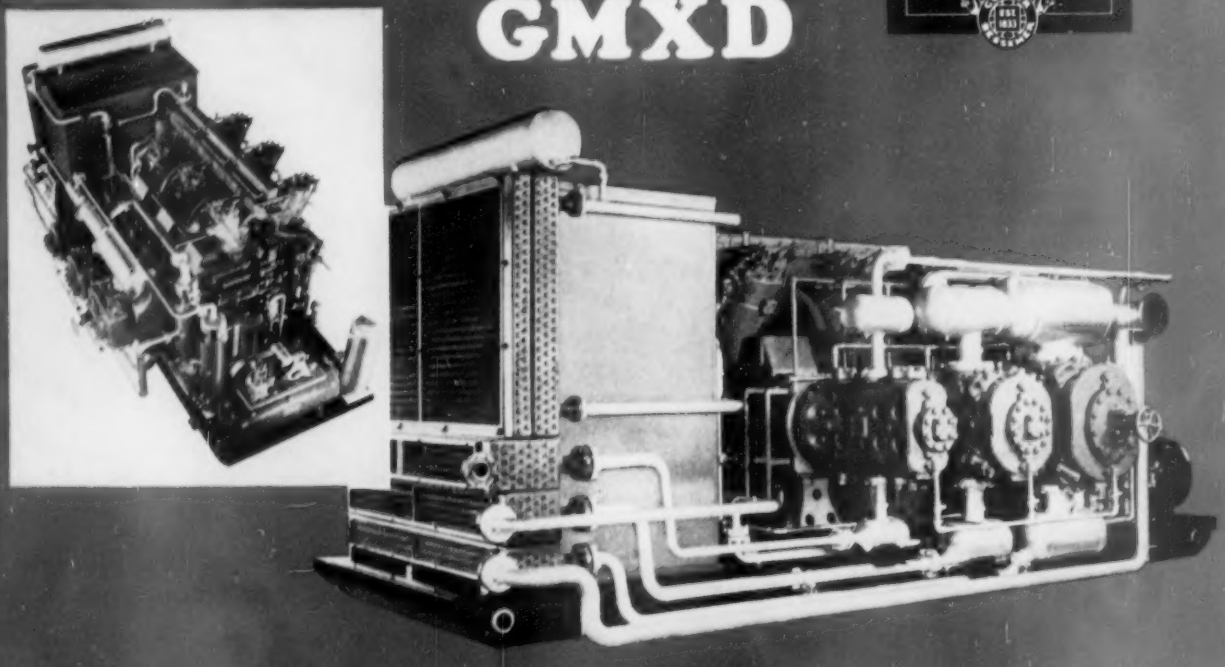
DATE _____

Outstanding!

THE NEW, COMPLETELY PACKAGED

COOPER-BESSEMER GMXD

Another Example of Efficient Power at Lower Cost



Outstanding in simplified, economical installation . . .

Outstanding in smooth, dependable operation . . .

That's the word from the field on the new, pre-assembled GMXD compressor package. Patterned after the proven Cooper-Bessemer GMX, the packaged GMXD's combine exceptional compactness with the very latest advancements in gas engine and compressor design. They're available in 4, 6, 8 and 10 cylinder sizes, 250 to 870 horsepower . . . ready now to reduce costs to a new low in gas lift, booster, gathering, pressure maintenance and many processing services.

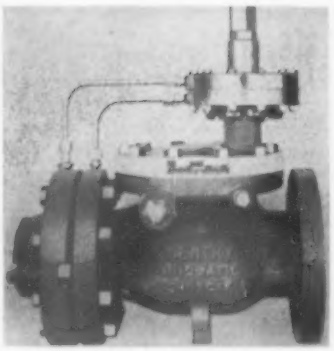
For fast service and delivery . . . in the heart of the oil and gas country . . . packaging of the Cooper-Bessemer GMXD is handled in Texas, Louisiana, Arkansas and New Mexico by Southwest Industries, Inc. of Houston 7, Texas. In these states, GMXD quotations are readily available from either Southwest Industries or any Cooper-Bessemer office.

New York City • Seattle, Wash. • Chicago, Ill. • Houston, Dallas, Greggton, Pampa and Odessa, Texas • Washington, D. C. Shreveport, La. • San Francisco, Los Angeles, Calif. • St. Louis, Mo. • Gloucester, Mass. • New Orleans, La. • Tulsa, Okla. Caracas, Venezuela • COOPER-BESSEMER OF CANADA, LTD., Edmonton and Calgary, Alberta, Canada.

MOUNT VERNON, OHIO

COOPER-BESSEMER

GROVE CITY, PENNA.



ton-type valve can be automatically or manually opened and closed from any remote location. The instant-opening feature of this valve is ideal for deluge systems. All Sentry valves are full-flow valves available in sizes 1½ through 8 in. **For more information write or call: Coppus Engineering Corp., 269 Park Avenue, Worcester, Mass.**

•

Hoist Hooks Lift 50 Tons, Forged in Closed Dies

A line of hoist hooks has been extended to include these 40 and 50-ton capacities. Forged in closed dies, each hook is heat-treated and tested on a standard tension machine to 50 per cent beyond its rated working load. **For more information write or call: J. H. Williams & Co., 400 Vulcan Street, Buffalo 7, N. Y.**

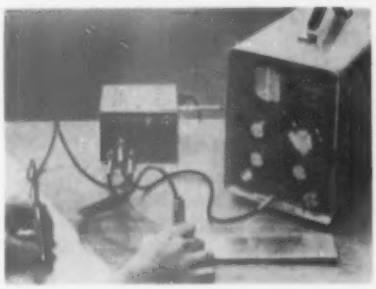
•

Thickness-Measuring Device Accurate to One Per Cent

Called the SO-100 Sonizon, this new ultrasonic thickness-measuring instrument is portable and weighs 30 lb. Reading of thickness is with the visual cathode-tube presentation. A 5-in. search cable makes the instrument adaptable for use in constricted areas or where many moves are necessary. Examples are boiler or vessel inspection and preventive-maintenance inspection of hollow box beams. The 3-in. presentation tube has a bright and clear trace. Light shields are not needed, even in outdoor work. Accuracy to ± 1 per cent of thickness is attainable.

A special clipper circuit eliminates hash or noise, equalizes the size of pip, and narrows the pip base to a straight line. The end result is excellent accuracy in reading multiple harmonic pip. A simple harmonic calculator is included with the unit for making meas-

OIL and GAS JOURNAL *Showcase* OF NEW EQUIPMENT



Here's everything it takes to provide SAFE Control Performance

MERCOID PRESSURE AND TEMPERATURE CONTROLS

GENERAL PURPOSE

OUTDOOR SERVICE

HAZARDOUS LOCATIONS

- *Outside Adjustments*
- *Visible Calibrated Dial*
- *Repetitive Trip Point*
- *Hermetically Sealed Contact*
- *Visible "On-Off" Switch Operation*
- *35 Years of Field Service*

PLUS These approvals and listings

FM

Series DAW for Fluids or Gases. Operating ranges to 300 psig. Series PQ for low pressures. Operating ranges from 0-0.1" pressure to 1-30" vacuum.

UL CSA

Series DA, DAW, DAE for pressures to 1,000 psig. Temperature ranges to 530°F.

Our engineers are at your service—send in your control problem or Write for catalog No. 856J

THE MERCOID CORPORATION
4201 BELMONT AVE., CHICAGO 41, ILL.

OIL AND GAS JOURNAL Showcase OF NEW EQUIPMENT

urements rapidly, up to 4 in., without any calculations. **For more information write or call: Magnaflux Corp., 7300 West Lawrence Avenue, Chicago 31, Ill.**

•

Hard-Metal Band Extends Tool-Joint Life

Adding materially to the life of tool joints, this advanced hard-metal application, known as Inarclad, welds the hard metal into the tool-joint steel rather than binding the hard metal onto the surface of the tool joint. The process uses the high alloy steel of the tool joint itself as the binder for the hard metal to reduce the chance of the band spalling or flaking.

Inarclad hard-metal bands are applied to the tool joint without grooving and result in a slight surface buildup. This buildup equals approximately 1/32 in. By applying Inarclad bands in this manner, the outside diameter of the tool joint remaining after all the hard metal is worn away is 1/16 in. larger than it would be had the same bands been laid in grooves.

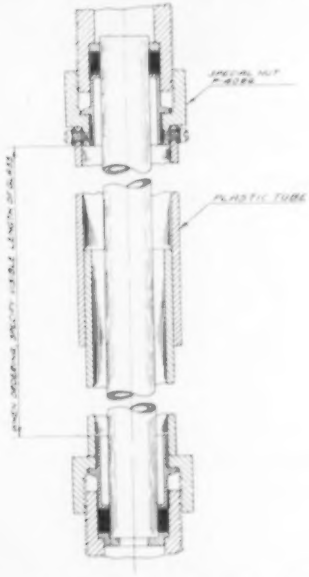
Inarclad bands have the following advantages: (1) Inarclad reduces chances of spalling or flaking, (2) provides superior weld quality, (3) gives uniform wear rates, and (4) insures that a uniform amount of hard metal is put into each band. **For more information write or call: Reed Roller Bit Co., P. O. Box 2119, Houston 1, Tex.**

•

Plastic Guards Protect Tubular Gage Glasses

These new lucite tubular guards built for protecting tubular gage glasses of liquid-level gages, are designed to take the place of metal-guard rods. They offer greater safety and protection as well as better visibility.

Easily installed, the strong plastic tube completely surrounds the gage glass and protects it from breakage



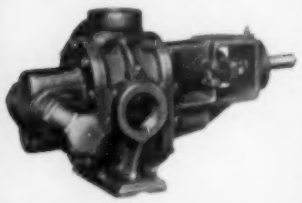
from the outside. One safety feature of the plastic tubular guard is that it contains and prevents liquid from spray-

Solve Your Pumping Problem with a

ROPER ROTARY PUMP

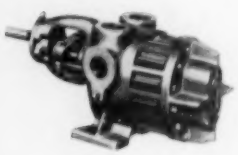
FOR REGULAR TRANSFER

The dependable Roper Series 3600 Pump — sizes 40 to 300 G.P.M., pressures to 90 P.S.I. Speedy, quiet, plenty rugged. Rotary gear principle permits operation in either direction. Self-lubricated by liquid pumped . . . self-priming . . . simple design permits quick, easy servicing.



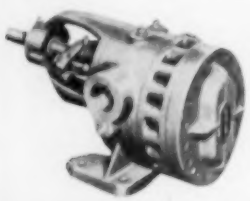
FOR MEDIUM TRANSFER

Roper Series F Pump—sizes 1 to 300 G.P.M., pressures to 300 P.S.I. Four-port design permits 8 optional piping arrangements . . . cuts installation time and costs. Equal size gears run in axial hydraulic balance. With packed box or mechanical seal; with or without relief valve.



FOR HEAVY TRANSFER

Roper Series H Pump — sizes 10 to 75 G.P.M., pressures to 1000 P.S.I. Ideally suited to those smaller diameter or long, high pressure gathering lines. Self-lubricated spur gears running in axial hydraulic balance, roller bearings and bronze wear plates contribute to efficiency and long service life. With packed box or mechanical seal.



SPECIFY ROPER

for truck transportation, stock tank transfer, and gathering line operations handling gasoline to heavy crude oils.

Geo. D. Roper Corporation

108 BLACKHAWK PARK AVENUE
ROCKFORD, ILLINOIS

ROPER Rotary Pumps

Sales and service in all oil producing areas

"He says we're doing so well on his present project he wants to talk about another job!"

Yes, this actually happens here at Procon. When it does it's very gratifying to us because it means that the care we have put into the selection of our people, the extra effort we exert to make sure each project is finished on schedule and up to every specification, are giving our good clients the satisfactory results they deserve.

Procon, a world-wide construction organization, is prepared to offer the broadest service, from complete construction of refineries, chemical and petrochemical plants, to adding process facilities, modernization, expansion or maintenance. Whatever your construction requirements, we will serve you well, anywhere.

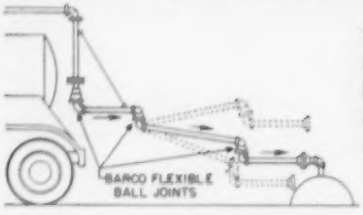
PROCON *Incorporated*

1111 MT. PROSPECT ROAD, DES PLAINES, ILLINOIS, U. S. A.

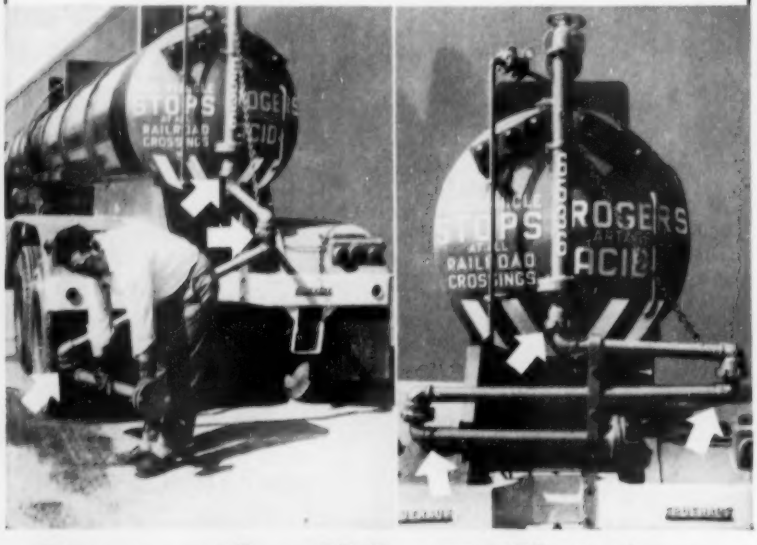
PROCON (CANADA) LIMITED, TORONTO 18, ONTARIO, CANADA
PROCON (GREAT BRITAIN) LIMITED, LONDON, W. C. 2, ENGLAND
PROCON INTERNATIONAL S. A., SANTIAGO DE CUBA

WORLD-WIDE CONSTRUCTION FOR THE PETROLEUM, PETROCHEMICAL, AND CHEMICAL INDUSTRIES

For SAFETY and Lower Costs in Handling Sulfuric Acid



The accompanying sketch shows how three Barco Ball Joints in unloading (or loading) line provide complete flexibility for making connections in any position. Note how line folds neatly on back of truck when not in use (photo below).



Barco Flexible Ball Joints Replace Hose

Two near-accidents with hose blowing out, while handling sulfuric acid with 30 psi air pressure, caused Rogers Cartage Co. of Chicago to change to Barco Flexible Ball Joints in loading lines on some 15 big trucks serving many chemical, petroleum, steel, and other customers in the Midwest area. Since making the change, Mr. Jack Kidder, Rogers Safety Manager reports that there have been no failures and little or no maintenance on the joints. Cost for frequent hose replacement has been eliminated. *Inquiries are invited, address Barco. Ask for Catalog 215B.*

ADVANTAGES

NO METAL-TO-METAL CONTACT BETWEEN MOVING PARTS – No ball bearings to corrode.

CHEMICALLY INERT GASKETS – No. 11-CT for corrosive service. Suitable for many liquid chemicals.

PRESSURE-SAFE! FIRE-PROOF! – Unequalled for SAFETY, DURABILITY, ECONOMY.

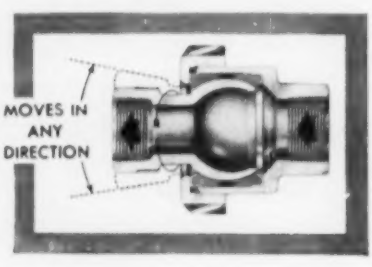
CHOICE OF STYLES – Angle or straight. Sizes ¼" to 6". Available in choice of metals, including stainless steel and special alloys.

APPROVED – By leading chemical manufacturers and trucking associations.

BARCO

BARCO Manufacturing Co.

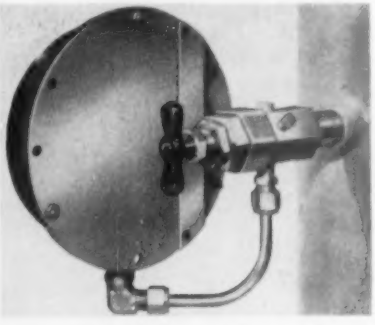
539J HOUGH STREET
BARRINGTON, ILLINOIS
In Canada: The Holden Co., Ltd., Montreal



OIL and GAS JOURNAL *Showcase* OF NEW EQUIPMENT

ing on anyone if gage glass should rupture and break. There are no blind spots with this new type guard for it provides clear visibility of liquid level. **For more information write or call: Jerguson Gage & Valve Co., 80 Fellsway, Somerville 45, Mass.**

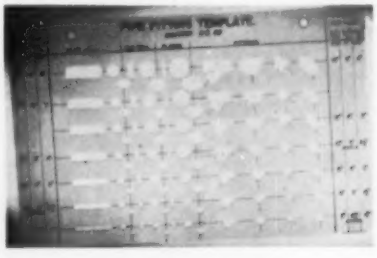
●



Gage-Type Valve Provides Multiple Openings

The gage-type Hex valve is a high temperature, durable, compact valve with multiple openings for directly connecting to tanks, pipe, or pressure vessels to provide for a gage, bleeder, vent, or instrument connection. It provides two outlets in the body so a gage may be connected to one side and an instrument, sample connection, or bleeder to the other. It also provides a safety bleeder within the body so that the pressure can be released safely before disconnecting lines or gages. This eliminates additional valves and pipe fittings. The gage is supported on a bracket. **For more information write or call: Hex Valve Co., P. O. Box 726, Bellflower, Calif.**

●



Template Includes 91 Pipe-Fitting Symbols

Condensing the most commonly used pipe-fittings symbols, this template is made up of two imprinted tables which

permit the user to transpose quickly in six different scales.

On this 5¼ by 8-in. condensed version, 91 symbol apertures have been cut through rigid, transparent vinylite with professional regard for accuracy, dimensional stability, and pencil tolerances. A wide range of commonly used symbols for outside diameter pipe, end bells, flanges, and fittings is covered. Foreshortened views are included. Printed tables relate the symbols to ⅛, ¼, ½, 3/16, ⅜, and ¾-in. scales. **For more information write or call: A. Lawrence Karp, 16 Putnam Park, Greenwich, Conn.**

•

Electric Indicator Makes Record of Tong Operation

Built for use with power tongs, this indicator-recorder is electrically operated. The recorder can be located away from the rig since electric wire can be strung easily. If need be, the recorder can be operated by an automobile battery.

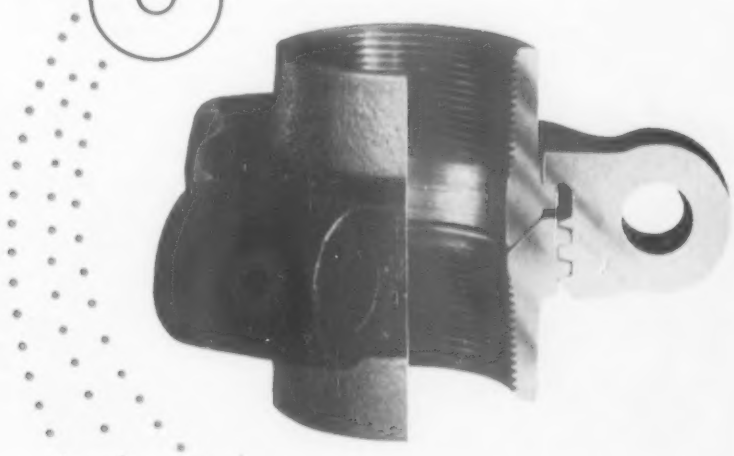
The instrument combination provides a practical method of preventing loose connections, galled threads, and miscounts in running casing. The indicator-recorder provides a record for the oil operator to prove that the job has been done properly. **For more information write or call: The Martin-Decker Corp., 3431 Cherry Avenue, Long Beach 7, Calif.**

•

Pipeline Coupling Repairs Misalignment Breaks

Made for repairing misalignment breaks in water, gas, or oil pipelines, the Series 4K flexible cut-in coupling is applicable to cast iron, asbestos-cement, or steel pipe. Installed with the pipe in place, this cut-in coupling acts as a double coupling replacing twice the length of the pipe cut out. The pipe is repaired quickly, as well as given additional flexibility, simply by cutting out any break, broken flange, bell, or

THE 3 MOST IMPORTANT FUNCTIONS OF A UNION



LEAK-PROOF SEALING—
EASY MAKE-UP AND BREAK-OUT—
LONG LIFE are basically the most important functions of a union. All are synonymous with Weco Unions.

Leak-proof sealing is the result of Weco's ball and cone seat that forms a metal-to-metal surface unequaled for positive sealing. Easy make-up and break-out is provided by Weco's precision machined Acme threads. The long life of Weco Unions comes from sturdier construction of sub ends and wing nuts that can take the toughest treatment a worker can hand them—and come back for more—month after month.

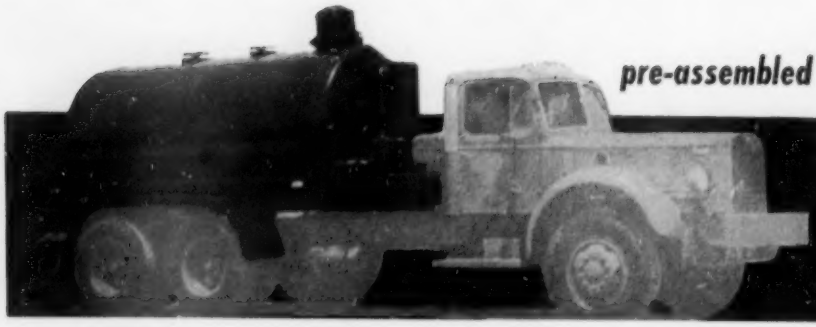
These time-and-money-saving functions make Weco your best union buy today. Get them at supply stores everywhere.

U-1-56

WELL EQUIPMENT MFG. CORP.
HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY *a subsidiary of* FOOD MACHINERY AND CHEMICAL CORPORATION



pre-assembled **VACUUM TANK**

Ready to Mount on Your Truck

SELF-CONTAINED MODEL WT is made with capacities of 35, 40, 45, 50 and 55 bbls. Comes complete, ready for work. Has its own gasoline engine, pump and 4-way valve.

THOMPSON, the originators of the unitized vacuum tank, now makes available this self-contained model WT. It's factory-readied for you to mount on any CA 120" truck in your own shops. Put the WT on your truck in the morning; put it to work after lunch!

WRITE FOR SPECIFICATIONS, complete with blue-printed mounting instructions. If you'd like to see a Thompson Unitized Vacuum Tank at work, we'll tell you where, in your own area, you can watch it save time and money — pay for itself time and time again. Write today.

FOR SUPER-FAST CLEANING OF:

- CRUDE TANKS
- DRAIN BOXES
- RUN-DOWN TANKS
- SEPARATOR BOXES
- CAUSTIC TANKS
- DRAIN LINES
- CATALYST SLURRY
- And a hundred other field, refinery and pipeline chores.

THOMPSON
TANK and MANUFACTURING CO. Inc.
2019 EAST WARDLOW RD. LONG BEACH 7, CALIFORNIA

SOLE LICENSEE TO MANUFACTURE VACUUM TANKS UNDER U. S. PATENT No. 2522077

USE KINZBACH MILLS for every cutting or milling job

Type "A" Mill

Type "D" Mill

Type "H" Mill

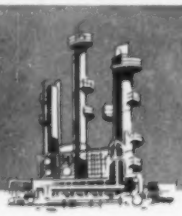
Type "I" Mill

Use Kinzbach Milling Tools for every whipstocking or metal cutting operation. Bodies are made of high quality steel, shaped for best cutting results. They have high-speed tool steel inserts which are ground and set at the most efficient angle for fast, uniform cutting action. Shown here are four popular models — see your Kinzbach Catalog for a description of the complete series of Kinzbach milling tools.

KINZBACH TOOL CO INC

Export Office:
74 Trinity Pl.
New York, N.Y.

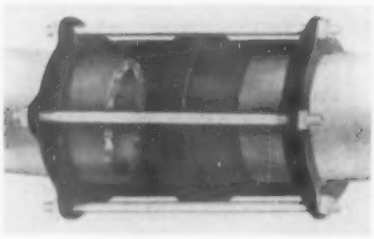
KINZBACH TOOL CO., INC. • P. O. BOX 277 • HOUSTON, TEXAS



Experience Plus
Technical Knowledge
Means *Timely*
FINANCING

Call or Write
OIL and GAS
DEPARTMENT

Mercantile National Bank
DALLAS, TEXAS



pipe coupling and using the cut-in coupling.

The pipe can be out of alignment over 6° and be repair-connected in place. Available in sizes from 2 in. up, the cast units are made with ductile iron flanges and cast-iron sleeves to resist corrosion so that the flexible coupling will last as long as the pipeline on which it is installed. **For more information write or call: Smith-Blair, Inc., 535 Railroad Avenue, South San Francisco, Calif.**

•

Tubing Stop Set and Reset Without Being Pulled

Allowing running speeds of 300 to 500 ft. per minute, the Type A-1 tubing stop may be set on wire line at any point in the tubing string including the upset. The tubing stop can be placed in the string by hand when the tubing is first run. The Type A-1 can be set and reset without being pulled from the well. It provides protection for open-end tubing when swabbing or when wire-line tools are used. **For more information write or call: Turbolite Co., 1020 Houston Avenue, Houston, Tex.**

•

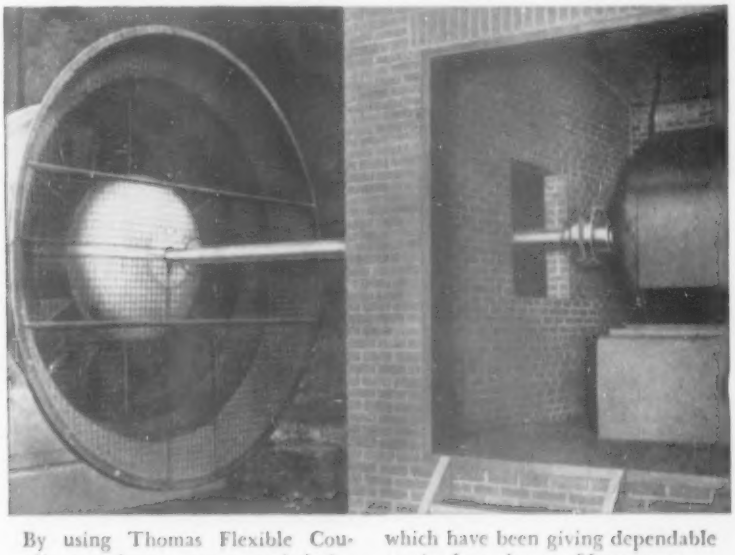
Treatment Stops Water Encroachment in Oil Wells

A new treatment, Visqueez, shuts off water encroachment in producing wells. Visqueez is an oil-cement slurry in which the oil has been especially treated prior to mixing so that the cement will be carried to a deep penetration. The slurry contains a low fluid-loss carrying agent that will hold cement in suspension almost indefinitely, which reduces the possibility of screenout and assures maximum penetration of the slurry. The setting time of Visqueez also can be controlled, which insures against premature setting of the cement under any conditions. Any part of the slurry that enters an oil-bearing portion of the formation that does not contain water is recoverable as free-flowing oil and cement.

Other advantages of the new slurry are that either common or quick-set cement may be used, temperature and pressure have no effect on the efficiency of Visqueez, and the properties of the slurry are such that the usual high injection pressures are not required.

A companion treatment, CPC kerosine Squeeze, is also available for use in conjunction with fracturing or acidizing treatments of producing wells. A shutdown time of only 15 minutes to 1 hour is required for this treatment. **For more information write or call: Chemical Process Co., Breckenridge, Tex.**

Eliminate Intermediate Bearings!



By using Thomas Flexible Couplings on long, unsupported shafts, intermediate bearings are eliminated. Thomas engineers tubular shafts free from lateral whip.

The large fan shown above is 16' from the motor to allow sufficient air intake. Miners working underground receive their fresh air supply from this fan and others like it, which have been giving dependable service for as long as fifteen years . . . without shutdowns for lubrication or maintenance of the couplings.

Thomas floating shaft flexible couplings are recommended for machine and marine drives, printing presses, paper and cement mills, cooling towers, diesel engines, pumps, compressors, and many other uses.

Only Thomas Flexible Couplings offer *all* these advantages

UNDER LOAD and MISALIGNMENT

1. Freedom from Backlash—Torsional Rigidity
2. Free End Float
3. Smooth Continuous Drive with Constant Rotational Velocity
4. Visual Inspection in Operation
5. Original Balance for Life

. . . and

THOMAS ALL METAL COUPLINGS HAVE NO WEARING PARTS SO LUBRICATION AND MAINTENANCE ARE ELIMINATED

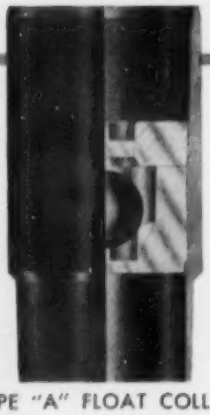
Write for Engineering Catalog 51A

THOMAS FLEXIBLE COUPLING COMPANY

WARREN, PENNSYLVANIA, U.S.A.

RECTOR

ALL METAL Casing Shoes and Collars give you THREE Important NEW Advantages!



TYPE "A" FLOAT COLLAR

TYPE "A" FLOAT SHOE

1. GREATER STRENGTH: Aluminum alloy internal parts have far greater impact, compression, tensile and shear strength than cement or bakelite.

2. PRECISION CEMENTING: Being all metal, they can be precision machined and ground to close tolerances for precision performance.

3. RAPID DRILLABILITY: Because of its superior strength, less aluminum alloy is required. It not only drills out faster but there is less material to drill out.

• These new Rector Type "A" cementing shoes and collars have internal parts of a special aluminum alloy that combines strength, abrasion resistance and drillability. The bodies are precision machined from high quality seamless steel—internal aluminum alloy parts are machined and ground to close tolerances.

Available in all standard sizes and standard threads FROM YOUR SUPPLY STORE.

EXPORT

Continental Supply Company • Mid-Continent Supply Company

Oil Well Supply Division

of United States Steel Corporation

RECTOR WELL EQUIPMENT COMPANY INC

MAKING THE OIL INDUSTRY SAFER

1100 NORTH COMMERCE ST. FORT WORTH, TEXAS

Houston Plant: 2215 Commerce St.

REPRESENTATIVES IN ALL ACTIVE FIELDS

RECTORHEAD RECTORSEAL

OIL AND GAS JOURNAL Showcase

- BULLETINS
- CATALOGS
- BROCHURES

How to Install and Take Care of Steam Pumps is the title of the new 23-page Bulletin G-2280 P. A step-by step series of 88 illustrations and captions presents the reader with information on increased service life of all types of steam pumps. Specifically designed to aid operators and maintenance men in adding years of reliable service to steam pumps, the new literature offers 28 tips on proper installation, and 54 tips on field-proven care techniques. **For more information write or call: Worthington Corp., Harrison, N. J.**

•

Anhydrous Aluminum Chloride. Called Product Development Bulletin AC-1, this four-page folder describes the anhydrous aluminum chloride as a crystalline solid shipped in granular or powder form. The bulletin lists the uses of the compound including (1) synthesis of ethyl chloride, (2) production of ethyl benzene, (3) production of butyl rubber, and (4) production of aviation gasoline, and other uses. The folder gives the analysis, properties, and grades of the material. **For more information write or call: Solvay Process Division, Allied Chemical & Dye Corp., 61 Broadway, New York 6, N. Y.**

•

Catawissa Unions and Valves. Covering a complete line of valves and unions, this 22-page publication explains the materials and methods used and includes cutaway drawings and photographs, and a page on test data. Catalog 56 includes tables showing for each union the pipe sizes, thread types, thread ranges, weight, and material. The catalog also details information on check valves. **For more information write or call: Catawissa Valve & Fittings Co., 206 Main Street, Catawissa, Pa.**

•

Berkeley Short Form Catalog describes newly developed systems for data handling and a new series of analog computers. Describing engineering systems, the catalog includes those for data reduction, data handling, data logging, industrial measuring and recording, and industrial process control. The

It takes a complete team to keep dependable drilling mud service available for you

Meet this Magcobar Man, the mud engineer... he's a good man to have on your drilling crew

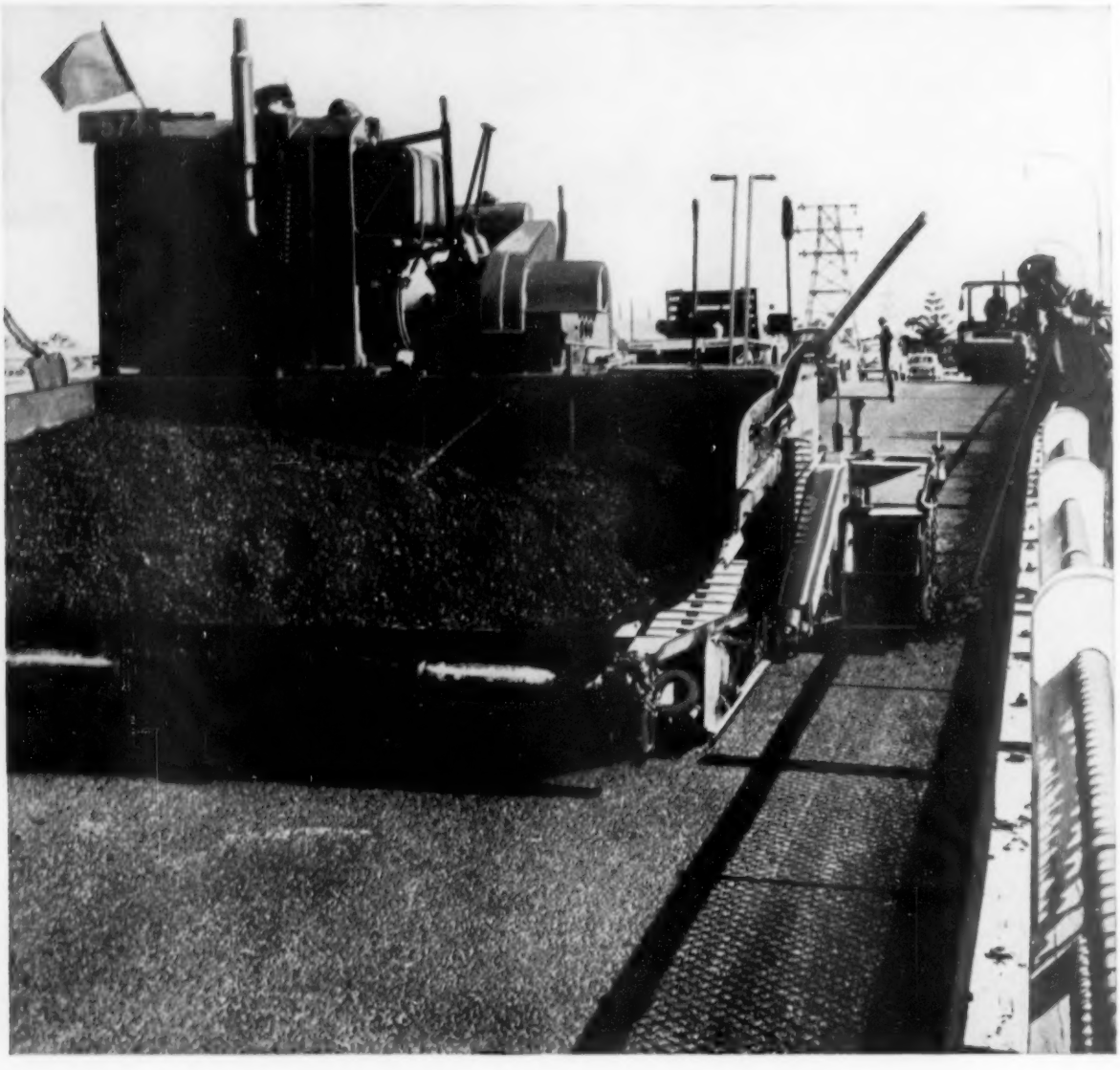
The Mud Engineer is the member of the Magcobar team who gives you prompt, accurate laboratory analyses of mud at the well. His skill, knowledge, training and experience are at your command wherever you drill on the North American Continent. Trained and paid by Magcobar, this man actually works for you at your well.

When you have a mud problem your Magcobar Mud Engineer, with the entire Magcobar organization behind him, is the man to call. He'll be there anytime day or night.

Magcobar
Complete
DRILLING MUD SERVICE

MAGNET COVE BARIUM CORPORATION

Houston, Texas



BP PAVES THE WAY

THE BP SIGN is a symbol of service to road users in many parts of the world.

The BP range of motor fuels and lubricants is by no means the only contribution of The British Petroleum Company to better motoring. Good roads are at least as important as good petrol and oil. And good roads, like good petrol and oil, are The British Petroleum Company's concern.

Bitumen for road-making is one of the many BP products that are speeding progress all over the world.

The BP Shield is the symbol of the world-wide organisation of

The British Petroleum Company Limited

BRITANNIC HOUSE · FINSBURY CIRCUS · LONDON, E.C.2.

publication also gives information on three new analog computers plus four components for control systems. The catalog describes newly developed frequency meters, decimal counting units, events-per-unit-time meters, time interval meters, nuclear scalers, and nuclear sample changers. **For more information write or call: Berkeley Division, Beckman Instruments, Inc., Department 7450, 2200 Wright Avenue, Richmond 3, Calif.**

●

Protection With Parlon. Employing four-color photographs, this 20-page booklet shows the uses of maintenance-type paints containing Parlon. Designed for finishes used under severe conditions, Parlon is a film-forming material unaffected by acids, alkalies, salts, moisture, and fungus. The booklet pictures the uses of paints containing Parlon on drilling rigs, storage tanks, and marine installations. **For more information write or call: Hercules Powder Co., Cellulose Products Department, Wilmington 99, Del.**

●

Chempumps for Low Capacity Leakproof Pumping. Describing the Series E pump, Bulletin 1060 contains four two-color pages. Using illustrations, the publication describes the pump as a compact, canned motor pump to be mounted directly in the pipeline. Of the axial-flow design, the pump gives heads to 20 ft. and capacities to 22 g.p.m. The bulletin details pump (1) performance, (2) N.P.S.H. requirements, (3) construction materials, and (4) dimensions. **For more information write or call: Chempump Corp., Station N, 1300 East Mermaid Lane, Philadelphia 18, Pa.**

●

Metering Pumps for More Dependable Water Treatment. This new 12-page, 2-color Booklet 600 featuring metering and proportioning pumps illustrates typical installations for injecting inhibitors in water-conditioning systems. It includes (1) complete pump specifications, (2) a table listing the chemicals most commonly used in water conditioning and what they are used for, and (3) the pump construction best suited to inject them. **For more information write or call: Hills-McCanna Co., 2443 West Nelson Street, Chicago 18, Ill.**

●

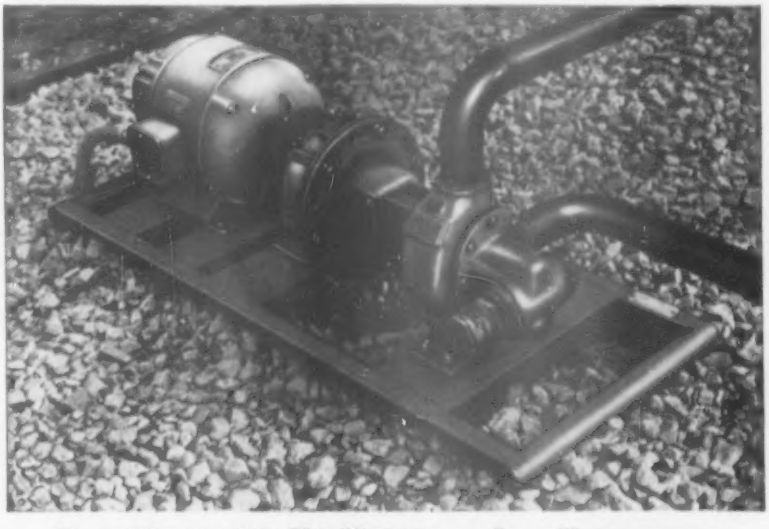
Electronic Temperature Controller. Furnishing information on an electronic temperature controller, Specification Sheet S1010-1 contains four pages and is punched for a loose-leaf folder. The folder explains that the electronic temperature controller is a nonindicating device which operates on the balanced-bridge principle. The device can be supplied as a (1) single point controller, using a single bulb, (2) as a differential controller, for control on the temperature difference between two bulbs, or (3) for cascade control, using two bulbs. The folder covers specifications, ranges and scales, and engineering drawings. **For more information write or call: Minneapolis-Honeywell Regulator Co., Industrial Division, Wayne & Windrim Avenue, Philadelphia 44, Pa.**

●

Oil-Field Metering and Oil and Gas Separation is covered in this 24-page, 2-color catalog. Skid-mounted, trailer-mounted, or permanently set, the units described include the well checker which separates oil, gas, and water, and the Rolocheck which meters oil and water. Catalog 56W contains data sheets, operational information, and applications. **For more information write or call: Rolo Manufacturing Co., 5814 Alief Road, Houston, Tex.**

●

CRV Pump Bulletin. Covering the line of class CRV cradle-mounted centrifugal pumps. Form 7223-B describes units with capacities from 5 to 2,800 g.p.m. and pressures of 10 to 525 ft.



R & M 5 HP "All-Weather" Motor drives pipeline gathering pump

R & M "All-Weather" motors are famous throughout oil country for their tough, weather-resistant design. You defy the elements with R & M motors, because they are designed to resist tough weather conditions.

Completely Weatherized

Steel parts are specially treated to resist rust and corrosion. Rotor assembly is sprayed with rust inhibitor. Cast-iron parts are given a zinc chromate and iron oxide primer. Terminal box is gasketed. Leads are sealed at the shell with a non-hardening compound.

Dust and Rat-Proofed

The housing is designed to keep out rain, mud, and dust. Openings are factory-screened to keep out rodents and debris. There are no kits to buy and install. Yet you still get the extra guaranteed service factor of a 40-degree motor. Clean-sweep ventilation provides a straight, unobstructed path for cooling air. Extra-large ball bearings are pre-lubricated and sealed to keep grease in, keep dirt out.

Sold at Standard Motor Price

R & M "Oil Country" motors are available in triple-rated, high-slip, and high-torque designs. Yet with all these features, R & M motors are sold at a standard motor price. No wonder they are so serviceable on thousands of applications. And you'll find them outperforming most other motors on the tough jobs.

Get Complete Information

Available in single-phase, 1-15 HP; totally enclosed, 1-40 HP; open-protected polyphase, 1-200 HP. Write Dept. OG for bulletin on R & M Oil Country motors and name of nearest R & M representative.

R&M *"All-Weather" Oil Country* **MOTORS**

ROBBINS & MYERS, INC. • Springfield, Ohio • Brantford, Ontario

"All-Weather" is an R & M trademark

FLINT STEEL

The completely integrated facilities and personnel of Flint's two conveniently located steel plants enables Flint to provide personalized services of engineering, estimating, detailing and fabricating.

Flint invites your inquiries and requests for consultation. For information contact either plant.

FABRICATED GALVANIZED STEEL

FABRICATED STRUCTURAL STEEL

FABRICATED STEEL PLATE

FABRICATED REINFORCING STEEL

STEEL WAREHOUSE DISTRIBUTORS

CONCRETE REINFORCING STEEL INSTITUTE C.R.S.I.

AISC

for over 40 years

FLINT STEEL CORPORATION

TULSA . . . MEMPHIS

total head. A concise tabulation of pump types with their rating enables the pump user to select the correct unit for his needs. A cross-section view points up the design features common to this line of pumps. The bulletin shows typical installation views of the models. It also presents performance tables, applications, and dimensions for the entire line. **For more information write or call: Ingersoll-Rand Co., 11, Broadway, New York 4, N. Y.**

●

Tubeseal Floating Roof. Fabricated for use in the petroleum industry, the Tubeseal system for floating-roof storage tanks is described in a new catalog, TS-56. Design and construction of this floating-roof seal eliminates all space between seal and product. Loss or iginition of product is virtually impossible. Illustrated with drawings and photographs, the catalog contains a section giving detailed answers to all questions on the design, construction, materials, applications, operation, and advantages of the Tubeseal. **For more information write or call: Hammond Iron Works, 630 Fifth Avenue, New York 20, N. Y.**

●

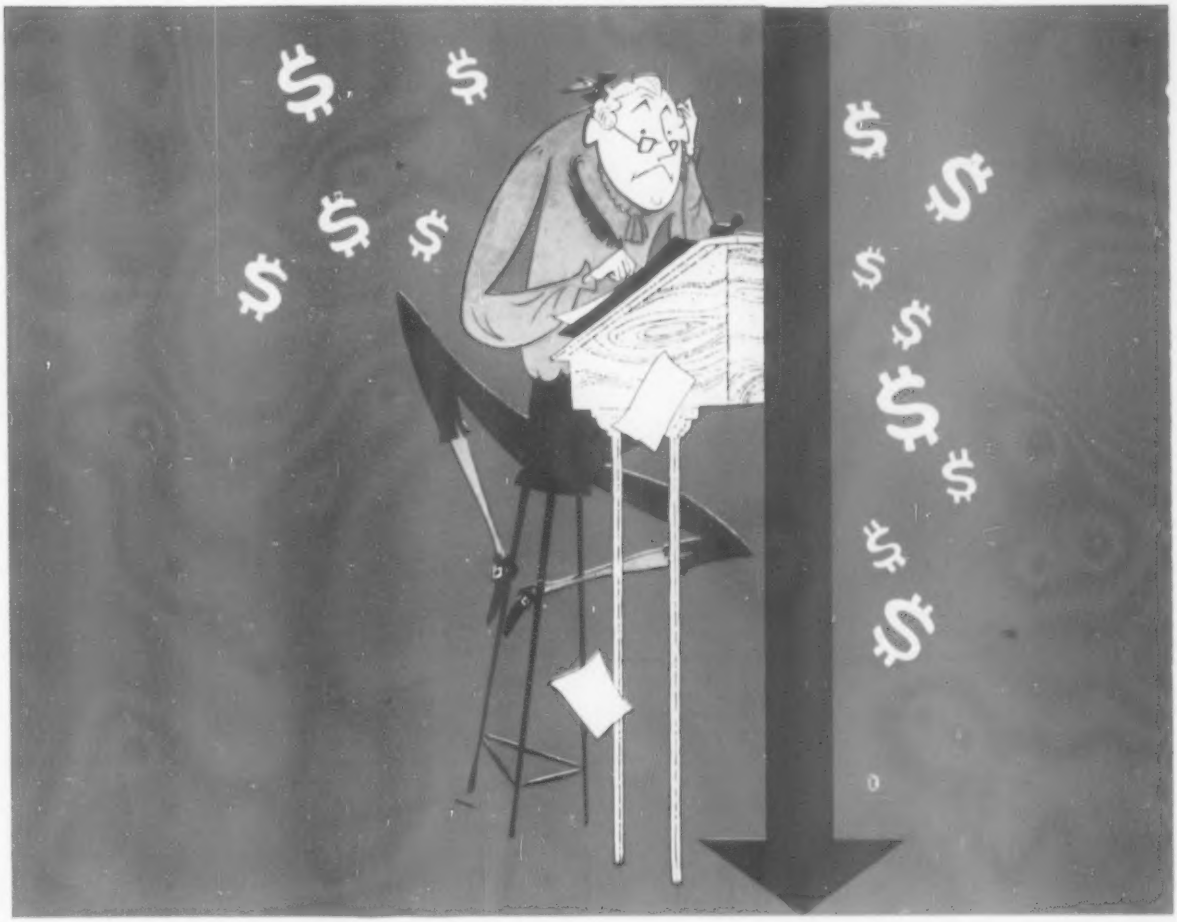
Alco 251 Diesels. Offered in ratings from 550 to 2,400 hp., a new diesel line is introduced in this 14-page bulletin. The engine series includes the six-cylinder in-line model and the 12 and 16-cylinder Vee-type engines. The two-color bulletin employs wide use of photographs of individual engine components, production-line views, and features a cross-section cutaway of the Vee-type engine. Also included are dimension charts and specification tables for the three engines. **For more information write or call: Alco Products, Inc., P. O. 1065, Schenectady, N. Y.**

●

Level-Trol Pneumatic Level Controller, a 32-page bulletin, explains the principle of operation of the displacement-type float. Bulletin F-4 illustrates the construction available for many applications that can use the Level-Trol. **For more information write or call: Fisher Governor Co., Marshalltown, Iowa.**

●

Riverfrac Development Bulletin. Explaining a new technique of fracturing oil and gas wells with plain water, this eight-page brochure gives the advantages, characteristics, and methods of treatment. Including tables, the bulletin sets forth laboratory data and case histories. **For more information write or call: Dowell Incorporated, P. O. Box 536, Tulsa 1, Okla.**



Figured your Caustic Soda costs lately?

An up-to-date analysis on the form of caustic soda you are buying may reveal a source of substantial savings for you.

Perhaps you should be buying liquor instead of dry. Maybe you should be getting 73% liquor instead of 50%.

A casual appraisal is not sufficient to uncover hidden savings. It takes delving into various cost factors such as purchase price of the material, transportation costs, unloading costs, labor cost for process handling, and investment cost of any added equipment to handle unloading and storage.

This is where Columbia-Southern's technical staff can be of service to you, and they are glad to do it, free and with no obligation whatsoever.

As a result of increasing costs in transportation, as well as changing conditions in your own plant, the best buy for you 5 years ago in caustic soda may not be your best buy today.

But why wonder? Why risk the chance of losing money every day from buying the wrong form of caustic? Contact Columbia-Southern's Pittsburgh office today. Arrangements will be made to give you an up-to-date analysis.

COLUMBIA-SOUTHERN CHEMICAL CORPORATION

SUBSIDIARY OF PITTSBURGH PLATE GLASS COMPANY

ONE GATEWAY CENTER · PITTSBURGH 22 · PENNSYLVANIA

DISTRICT OFFICES: Cincinnati • Charlotte • Chicago • Cleveland • Boston • New York • St. Louis Minneapolis • New Orleans • Dallas • Houston • Pittsburgh • Philadelphia • San Francisco

IN CANADA: Standard Chemical Limited and its Commercial Chemicals Division

Six choices of corrosion resistant tubes and sockets

4130 alloy steel tube with alloy steel tip and socket.

403 stainless steel tube with alloy steel tip and socket.

403 stainless steel tube with 416 stainless tip and socket.

316 stainless steel tube with alloy steel tip and socket.

316 stainless steel tube with 303 stainless tip and socket.

Monel tube with alloy steel tip and socket.

Tubes and sockets listed above are available in Type 100 Mastergauges which are designed for extreme service and pressures. Type 101 Mastergauges, for medium and high pressures, are also available with:

4130 alloy steel tube, socket and tip.
410 stainless steel tube, socket and tip.
410 stainless steel tube with 416 stainless socket and tip.

STAINLESS...from socket to tip

Another Marsh development! The superlative Mastergauge is now available with stainless and alloy steel bourdon tubes. Try to find a corrosive service that isn't covered by range of materials listed above.

Tube, socket and tip—every part subjected to a corrosive medium —are fused into one piece by the "Connoweld" process . . . the exclusive process that distinguishes the Marsh Mastergauge from all other gauges.

Whether you need a gauge for corrosive service or any other critical application, Mastergauge is the one correct answer. It gives you the leak-proof Connoweld construction, the stronger, more durable copper-clad Marshalloy case, the precision Mastergauge movement, the "Recalibrator" to preserve its unmatched accuracy. Ask for data covering your specific gauge needs.

MARSH INSTRUMENT CO. Sales Affiliate of Jas. P. Marsh Corp. **Dept. L, Skokie, Ill.**
★Marsh Instrument & Valve Co. (Canada) Ltd. 8407 103rd St., Edmonton, Alberta
Houston Branch Plant: 1121 Rothwell St., Sect. 15, Houston, Texas

Stainless steel tube in the new SAFECASE

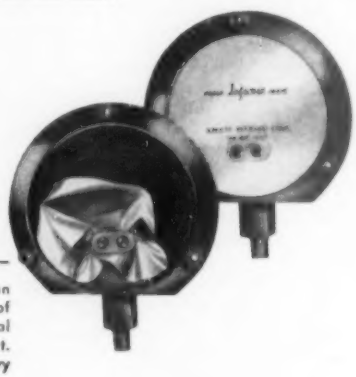
Here is a great combination . . . Marsh Mastergauge with corrosion resistant bourdon tube in the revolutionary Marsh Safecase . . . everything it takes for corrosive service where a surge of overpressure can occur.

MARSH GAUGES

"THE STANDARD OF ACCURACY"

★ *Marsh Gauges are made in Canada*

(SEE ADDRESS ABOVE)



Explosive force merely opens safety back—

Photo shows result of laboratory test in which gun cartridge was discharged in rear compartment of Safecase. Thin, tough back yields to abnormal pressure, but cannot be dislodged by blowout. Front of gauge remains intact, protected by heavy metal barrier.

EQUIPMENT MEN . . . in the News

Halliburton Names Six To Executive Posts

R. G. Kelly, formerly vice president in charge of field operations, and W. D. Owsley, formerly vice president for engineering advice to management, have been elevated to the posts of senior vice presidents of Halliburton Oil Well Cementing Co.

R. G. KELLY

W. D. OWSLEY

Succeeding Kelly as vice president in charge of field operations is Harry P. Conroy, formerly northern region vice president. In his new post, Conroy will supervise the company's domestic field operations, which are administratively divided into three regions.

D. R. Yager, regional vice president, was assigned the central region and Hosea P. Hearn, regional vice president, was assigned the northern region.

The southern region was assigned to E. L. Paramore, formerly manager of Halliburton's South Louisiana division. The new regional manager will be located at the company's Duncan, Okla., headquarters.

H. P. CONROY

E. L. PARAMORE

Kelly, a director of the company, began service with Halliburton as a driver of a cementing truck in 1930. Owsley, who has developed many technical advancements in drilling and producing, joined the company in 1932.

Diamond Drilling Group Elects Officers

Officers of Petroleum Diamond Drilling Association shown are: J. C. McNeal, Hillmac Corp., Midland, vice president; Carroll Deely, Drilling & Service, Inc., Dallas, president; C. C. Miller, Diamond Contractors, Ltd., Dallas, secretary and treasurer; and Ed Williams, Jr., Williams Bit & Tool Co., Greenville, vice president.

Also included as members of the association are: Bert Sutton, Jr., P&S Engineering Co.; Clyde Foster, Foster Diamond Coring Co.; Jake A. McCallister, Diamond Bit & Coring Co., and Graham Diamond Coring Service Corp.; J. R. Mayeaux, Hycalog, Inc.; R. W. Stewart, Diamond Oil Well Drilling Co.; Halbert Pierce, P-N Diamond Coring, Inc.; Arthur W. Sour, Jr., Diamond Coring Co.; B. G. Harmon, DiKor Diamond Coring Service; Bennie R. Jones, Diamond Coring, Inc.; Patrick Adamson, Wheel Trueing Tool Co.; and Barney Haffner, American Coldset Corp.

Shaffer Moves to New Shop and Offices in Avenal

Shaffer Tool Works has moved into the company's new shop and offices in Avenal, Calif. The new shop, under management of Harvey E. Culp, will be used for sales and service of Shaffer oil tools to all operators and contractors in the Kettleman Hills and Coalinga area.

Shaffer Tool Works now has seven installations in California, at Brea, Santa Fe Springs, Bakersfield, Taft, Ventura, Santa Maria, and Avenal, also representation at Willows.

Other installations include Farmington, N. M.; Odessa and Houston, Tex., besides representation at Sherman; Houma, La.; Oklahoma City; Casper, Wyo.; an office in Denver; and representatives in Edmonton, Canada.

Land Named Eastern Canada Field Engineer by Chiksan

Frank N. Land has been named senior field engineer by Chiksan of Canada, Ltd., it has been announced by G. R. Winder, vice president and general sales manager. Land will be available to Chiksan sales representatives in eastern Canada to provide engineering assistance on Chiksan all-metal tank-truck and tank-car loading racks, and for marine and barge loading arms. He will be available for consultation on in-plant uses of Chiksan swivel joints, and on the Intelli-Giant hydraulic monitor.

Land joined Chiksan after 6 years with Lynn Macleod Engineering Sup-

United Supply has put SERVICE on the map in the five states where United stores are serving oil field needs around the clock. When you need real service, be sure to call United Supply.

YOU CAN RELY ON UNITED SUPPLY!
UNITED SUPPLY
COURTESY • SERVICE • DEPENDABILITY

UNITED SUPPLY

AND *Manufacturing* COMPANY

TULSA, OKLAHOMA

Stores in: KANSAS, OKLAHOMA, TEXAS, LOUISIANA, AND NEW MEXICO

COURTESY • SERVICE • DEPENDABILITY

plies, Ltd., a Chiksan sales representative. He will have headquarters in Montreal, working with Lynn Macleod Engineering in Quebec and the Maritime Provinces, and with G. W. Beecroft Co. of Toronto, in Ontario, Chiksan representatives.

Jeffries Inaugurates Fast Oil-Field Delivery Service

H. J. Jeffries, president of H. J. Jeffries Truck Lines has announced a new hot-shot delivery service for the oil industry that will cover 18 states and Canada from the Mississippi Valley to the Rockies and from Canada to the Gulf of Mexico.

Fast deliveries will be made in small, low trailers allowing easy movement through most terrain regardless of conditions. The service will be operated from headquarters in Oklahoma City, Houston, and Tulsa.

H. J. Jeffries Truck Lines was organized in 1934 and has grown to include over 180 pieces of rolling stock with 225 employes. Division offices are located in Peoria, Ill.; Pueblo, Colo.; Houston; Tulsa; and Texarkana, Tex.

Thermoid Opens New Houston Warehouse

Thermoid Co. of Trenton, N. J., has announced the opening of a new warehouse in Houston. According to company officials, this new warehouse makes possible larger stocks and faster service of Thermoid industrial and oil-field products.

The new operation will be managed by W. N. Jordan under the direct supervision of Norris B. Green, Thermoid district manager.

Opening-day ceremonies were attended by Warren E. Hill, president of Thermoid Co., George S. Lamson and Charles M. Scholz, vice presidents of the company. Lloyd Tracy, Mike Hazel, Dan Barr, and Elmer Westfall, all of Oil Well Supply Co., accompanied the Thermoid executives.

The Houston unit is the seventh in a series of new regional warehouses that Thermoid has opened during the past year. The structure provides 20,000 ft. in the warehouse and 2,500 ft. of office space. A friction-products service department has been included in the new operation to enable the company to offer speedier service on the special brake-lining requirements of oil-field machinery and auxiliary equipment.

Weco Names DeLong South Louisiana Representative

Dale DeLong has been appointed sales representative in the southern Louisiana area for Well Equipment Manufacturing Corp., according to John W. Gates, sales manager for the company.

Before beginning his sales work in South Louisiana, Dale completed a 30-day training period in the Weco plant at Houston. He will be responsible for the sale of all Weco and Chiksan products.

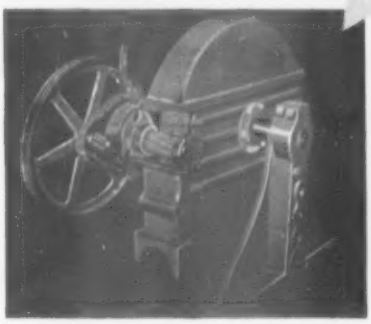
DeLong will have his headquarters in New Orleans, where he replaces L. L. Durkin who has been transferred to the newly created position of city sales in Houston.

Chicago Pneumatic Names Oil-Tool Sales Manager

W. S. Sease has been appointed sales manager of the oil-tool division of Chicago Pneumatic Tool Co. His headquarters will be at the Fort Worth plant.

Sease was formerly regional sales manager in the southeast section of Texas and has had considerable experience in rock-bit sales prior to and

Change Speed Reductions
QUICK!...



with a JENSEN JACK

A JENSEN is without question the most versatile and practical pump jack you can buy.

Changing gear reductions, from single to double or from double to single, is a quick one-man operation requiring no major mechanical alterations and a minimum of downtime.

The JENSEN one-man counterbalance, double tapered roller type bearings, precision shaved gears and oil bath lubrication are other features that add to the functional design and trouble-free operation of a JENSEN JACK. See your dealer or write us for detailed information.

JENSEN JACKS

JENSEN BROS. MFG. CO., INC.
Coffeyville, Kansas, U.S.A.
Export Office:
25 Broad Street, New York City

since becoming associated with Chicago Pneumatic Tools.

BJ Service Names Gardner As Texas Sales Supervisor

The appointment of J. B. Gardner to Texas division sales supervisor has been announced by Frank Smith, vice president in charge of sales for BJ Service, Inc. This announcement came in conjunction with the presentation of a 5-year service award to Gardner.

Gardner began service with the company as a service engineer.

Gulf Tool Names Alabama Distributor, Opens Store

G. W. Morrison, vice president and general manager of Gulf Tool Co. of Louisiana, Inc., located in Harvey, La., has appointed Oil Field Supply Co. in Citronelle, Ala., as distributor in that area.

Gulf Tool has opened another company store in New Iberia, La. Daniel Daigle will be the company salesman in the New Iberia district.

Gulf Tool Co. of Louisiana handles sales and rentals of Gulf Tool Co., Inc., Johns-Manville Sales Corp., and B & W Metals Co. products.

Alten Appoints Hunt for Kansas Sales and Service

F. F. HUNT

The appointment of F. F. (Chick) Hunt as sales service representative for the State of Kansas has been announced by Warren M. Benson, vice president and sales manager of Alten Foundry & Machine Works, Inc., Lancaster, Ohio.

In his new position, Hunt will coordinate Alten sales, service, and merchandising activities through supply stores in the Kansas area.

McKay Joines Parsons

John E. McKay has been appointed to the business-development staff of The Ralph M. Parsons Co. McKay was formerly associated with The Fluor Corp., Ltd., for 14 years in various sales capacities. Prior positions were held with Sinclair Refining Co. and Carter Oil Co.

Otis Honors Wilhoit for Twenty Years' Service

Lowell M. Wilhoit, vice president of Otis Engineering Corp., Dallas, was given a watch and scroll of appreciation by the company at a banquet in his honor recently. H. C. Otis, president, and Herbert C. Otis, Jr., executive vice president, made the presentations. Hosts at the banquet were the firm's board of directors and other officials of the company.

Shown at the presentation are: (seated) Mrs. Otis, Jr., Mrs. Otis, Sr., and Mrs. Clifton Otis Cassidy. Standing are Otis, Jr., Wilhoit, Otis, Sr., and W. E. Rich, vice president and treasurer.

Wilhoit has spent his entire business career with Otis. He worked as a field engineer for Otis in Houston, Corpus Christi, and Oklahoma City, and in 1938 was appointed district superintendent for Otis at New Iberia, La. He was subsequently promoted to assistant chief engineer in Dallas, chief engineer, general superintendent and sales manager for Otis Pressure Control, Inc., an affiliate company, and later to vice president and director of engineering.

Modern factory production methods enable Southern Mill to manufacture, ship and erect any number of homes or field office buildings you need . . . in a hurry. No shopping around for materials or weeks of waiting.

STURDYBILT Prefabricated Homes can be shipped and erected in days instead of weeks. Save time . . . save money, and have quality field housing for your workers.

Specify STURDYBILT.

STURDYBILT PREFABRICATED, DEMOUNTABLE HOUSES

SOUTHERN MILL & MANUFACTURING CO. • TULSA, OKLAHOMA

STURDYBILT HOUSES COMPLY WITH COMMERCIAL STANDARD CS125 OF THE NATIONAL BUREAU OF STANDARDS FOR PREFABRICATED HOMES

Brazos Equipment Rental Acquires Anderson Assets

P. E. McDANIEL

DON SHARP

With the completion of negotiations for acquisition by Brazos Equipment Rental Co. of the pipeline-contracting assets of Anderson Brothers Corp., previous reports of the transaction were clarified.

Paul E. McDaniel, owner of Brazos Equipment Rental Co., of Houston, is also president of Brazos Engineering Co., Inc., Paul E. McDaniel, Inc., and other companies. He explained that reports referring to these companies as receiving the assets of Anderson Brothers Corp. were in error, probably due to the close similarity of company names.

The pipeline-construction equipment acquired by Brazos Equipment Rental Co. is now located in Texas, Montana, Wyoming, Minnesota, Louisiana, Ohio, and North Carolina.

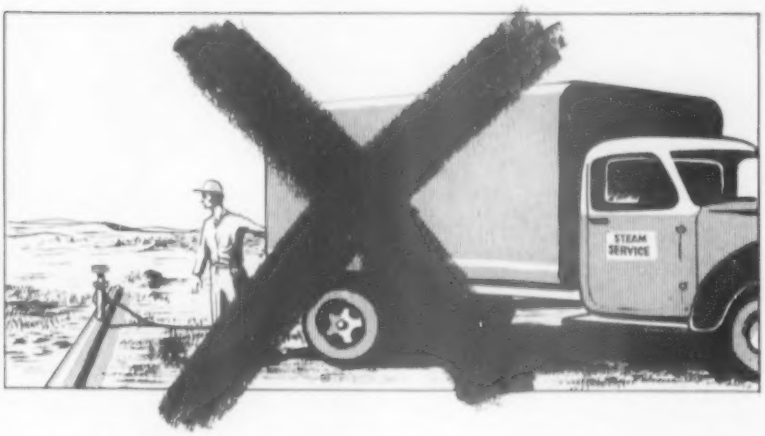
This equipment is now available to contractors on a rental basis, or on a rental/purchase, outright sale, or trade arrangement. The equipment can be rented and moved to any job in this country, Canada, or Mexico. Machinery of most sizes and makes can be rented, from fill-in units a contractor may need to augment his own equipment, up to complete spread equipment.

Don Sharp, who is general manager of Brazos Equipment Rental Co., is in charge of sales, distribution and application of heavy contractors' equipment for oil-field, marine and industrial uses. L. J. Knox is field representative, and M. D. Gier is shop superintendent.

South Chester Tube Elects Gibson Vice President

Francis H. Gibson has been elected vice president, sales, by South Chester Tube Co., Chester, Pa.

Gibson, who joined South Chester Tube in 1927, served as a sales representative in Texas and West Virginia, then became district sales manager for the Pittsburgh, Pa., area. In 1940 he was named general manager of sales.



Costly Paraffin Steaming Program ended by IPM "In-Place" Cleaning and Coating

So serious was the paraffin problem in a 1750-foot 2-inch production flow line in the Harper Field near Kermit, Texas, that the line had to be steamed at 15-day intervals during cold weather. At $35.00 per treatment, the bill averaged $420.00 annually.

In February of 1955, by use of unique, in-place methods, IPM internally cleaned this line, then applied a .005" coat of high-gloss epoxy base resin. This application ended the paraffin problem. No further steaming or other paraffin control measure has been required.

Direct costs ($455.00) of the IPM treatment barely exceeded costs of one full year's steaming program. Shutdowns and costly delays have also been eliminated.

Multiply this experience by the number of similar lines in which you are interested, and you'll quickly see why IPM is so often the answer to paraffin in pipelines. And paraffin is only one of the many internal pipeline problems solved by IPM's methods.

Why not write today for further information? Your letter requesting details brings prompt reply.

Internal Pipeline Maintenance Co.

2105 NORTH JACKSON ODESSA, TEXAS

the company with the longest continuous service experience in its field

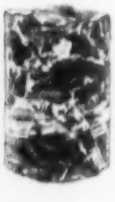
Comprehensive core analysis data immediately required for drilling and completion operations is best obtained from properly preserved (quick-frozen) samples.

But the scope of additional information obtainable later from "warehouse" as well as from preserved cores is virtually limitless for application to calculations of primary and secondary recovery.

Unlike routine core analyses usually performed on a per-well basis, special core analysis data are generally applicable to an entire field problem. In addition to this significant economical aspect, the original cost of coring is minimized by broadening the scope of reservoir information from cores already accessible at the surface.

Take an average day in Core Lab's Special Core Analysis Studies Section. You'll find expertly trained engineers developing critical data (see below) on cores from reservoirs located throughout the world—Iraq, Canada, Kuwait, Venezuela, The United States.

Think twice before you send old cores to the junk pile. They've still got a big story to tell.



SPECIAL CORE ANALYSIS SERVICES

Water Flood Susceptibility, Water Permeability, Restored State Flood, Oil/Water Relative Permeability, Gas/Oil Relative Permeability, Capillary Pressure, Formation Resistivity, and various other measurements for use in individual field problems.

For a set of six bulletins describing the above services, send request on your company letterhead to Core Lab, Box 10185, Dallas.

CORE LABORATORIES, INC.

801 CORE STREET, DALLAS, TEXAS

CORE LAB

PETROLEUM RESERVOIR ENGINEERING

DALLAS, FT. WORTH, HOUSTON, CORPUS CHRISTI, McALLEN, SAN ANTONIO, MIDLAND, ABILENE, PAMPA, MONAHANS, LUBBOCK, LOVINGTON, SHREVEPORT, TYLER, EL DORADO, OKLAHOMA CITY, WICHITA FALLS, TULSA, ARDMORE, BARTLESVILLE, LIBERAL, ARKANSAS CITY, GREAT BEND, LAFAYETTE, NEW ORLEANS, HATTIESBURG, DENVER, STERLING, CASPER, WORLAND, KIMBALL, NEBR., FARMINGTON, BAKERSFIELD, LONG BEACH, CALGARY, EDMONTON, REGINA, VENEZUELA, S. A.

Where Every Other Hole Is a Hit

by Frank J. Gardner

THE average oil man would flip his lid at the prospect of getting a producer for every two wells he drills. And yet, that's exactly what's been happening in the Peace River region of northeastern British Columbia. In the 4 years 1952 up until now, B.C. operators have drilled 140 wells; of these, 70 have been producers.

A vast hunting ground . . . But Peace River is not for the average oil man. It's a big-time operation in one of the last frontiers of civilization on this continent. The going is rough and expensive.

Practically every major American and Canadian oil company, and many a European company, is involved in this remote exploration program; it covers 30 million acres in British Columbia, 25 million acres in Alberta, and an unknown amount of acreage extending 300 miles northward into the Northwest Territories.

The campaign has hardly begun. The widespread successes already scored are shown on the map, but they are nothing compared to what's going to happen in the next 4 years.

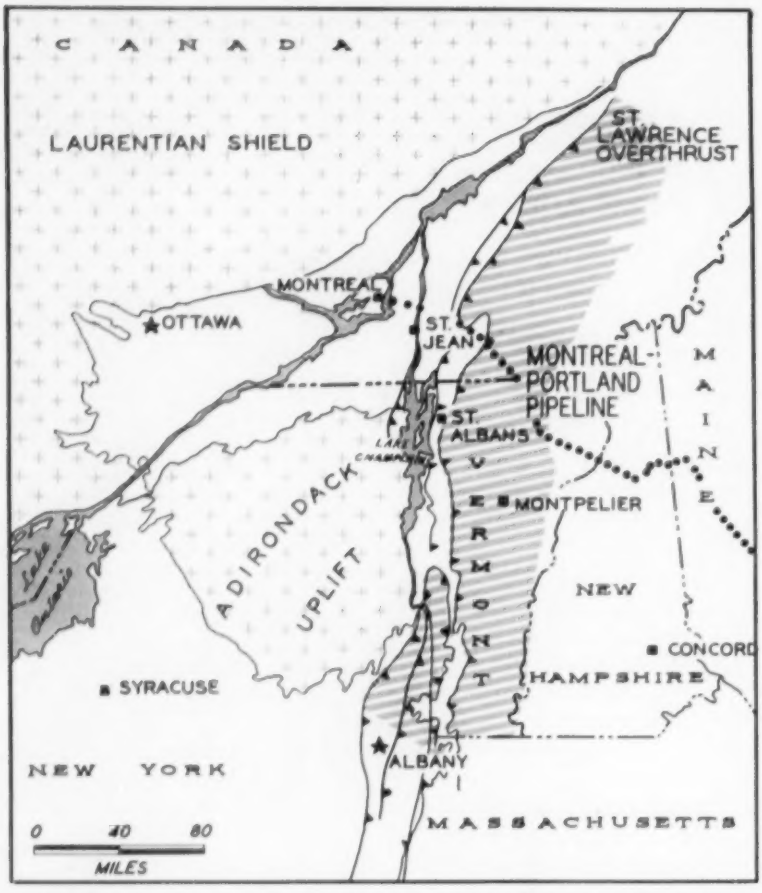
With reasons for optimism . . . Why this optimism? There are many reasons. The most important is the impending completion of the Westcoast Transmission Co., Ltd., gas pipeline between Peace River and the Pacific Northwest country. At long last, Peace River gas will flow southward to market through a 650-mile, 30-in. line with a capacity of 660 million cubic feet per day. It is expected to be finished by November 1957.

Geologic optimism is unbounded, for here is the thickest sedimentary section in western Canada. At A on the map, Pacific Petroleums, Ltd., drilled its well No. 23 Fort St. John to a depth of 13,955 ft. in lower Devonian rocks and was still several hundred feet short of the pre-Cambrian. Besides this thick section, geologists point to the presence of large structural folds throughout the area, as contrasted to the southern Alberta plains, where such folding is rare. Add to this the existence of at least 19 proved potential reservoir rocks (9 in one well at Fort St. John), and the optimism is indeed justified. These range from Cretaceous to Devonian in age, and from 3,000 to 8,000 ft. in depth.

So far, only two oil pools have been found — one at Boundary Lake and another in Fort St. John field. The first well drilled at Fort St. John in 1951, Pacific et al.'s 1 Fort St. John, had an encouraging oil show, and in mid-July of this year, these same operators found oil in the No. 45 well at 6,385-6,413 ft. in the Permo-Pennsylvanian. Boundary Lake field, discovered in 1955, has two oil wells producing from Triassic at the 4,300-ft. level.

Will see wide exploration . . . As progress is made, exploration can be expected to probe into even more remote areas south, north, and west of Fort St. John, in unsurveyed territory. One such wildcat venture is now under way at Monkman Pass, 100 miles south of the town. Here, Richfield Oil Corp., Peace River Petroleums, and Compagnie Francaise des Petroles are drilling the 1 Grizzly Valley, a 12,000-ft. venture in rugged mountain country. It's on a seismic-detailed anticline 20 miles long and 2 miles wide. The wildcat now is down to 8,000 ft., and if it hits, Peace River will have had another hundred miles added to its sphere of interest.

OIL AND GAS DEVELOPMENT in the Peace River region of northeastern British Columbia points to future development of a major province of continental importance.



INDEX MAP shows the Lowlands of Quebec now undergoing the first scientific exploration for oil and gas. Potential gas and oil territory extends southward into the State of Vermont for 15 to 20 miles. Fig. 1.

Quebec Adds Oil and Gas to Vast Mineral Resources

. . . search centers in lowlands

by Edmund Fancott

THE search for oil and gas in the lowlands of Quebec is rapidly reaching an intensity never before ventured in this northeastern corner of the continent. The potentiality of the region has been suspected for many years but various factors have delayed serious exploration.

It could be said that one of the main reasons for delay is the natural conservativeness of the Canadians, but a more accurate estimate is that Canada, and Quebec particularly, has been blessed with such an embarrassment of riches in natural resources that each potential must await its turn for development. The mining industry of Quebec for the past 50 years has been notable for a series of spurts of development, each embracing a newly opened area of exploration which has absorbed a great part of the technical and financial resources available.

The author is with Eastern Canada Gas & Oil, Ltd., Montreal.

Research prepared the way . . . But behind the more spectacular aspects of "boom" development, the Quebec Department of Mines through its geology division can always be found building up the basic research and the field surveys preparing the way for the next spurt of development.

This is what has happened in the case of oil and gas in the lowlands. As far as it can be done from the relatively small amount of drilling previously undertaken in the region and from the natural features, all possible information that can be of value in assessing the potentialities of the region has been coordinated in a series of reports.

The land situation has been taken firmly under control by the Department of Mines and a policy is being formulated which will deter promotional speculation. This will encourage those companies with the best technical and financial resources. It will at the same time encourage wildcatters who are prepared to risk their own money and experience.

Regional Geology

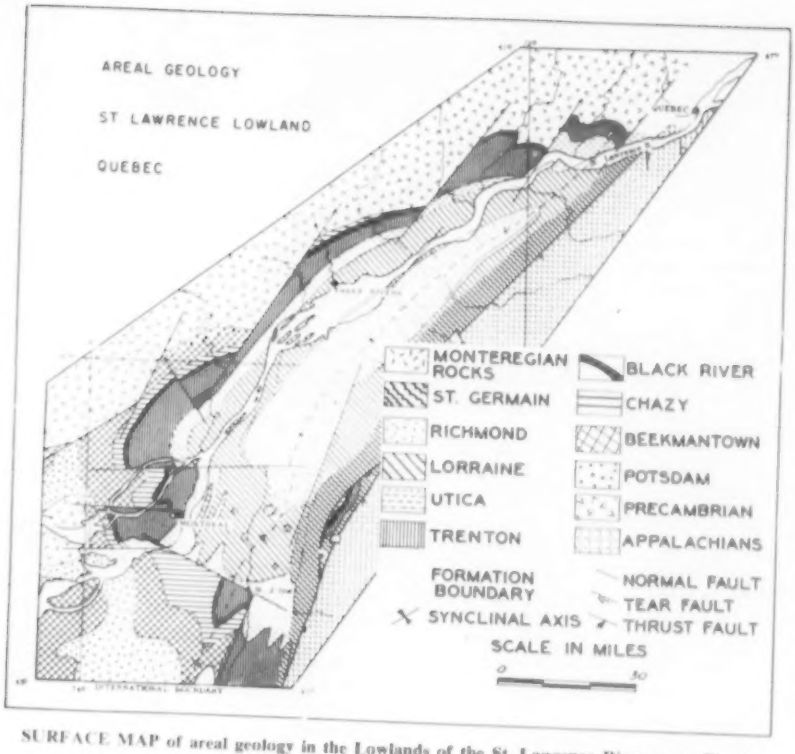
The major work of the present exploration period is being carried out by two companies, Imperial Oil, Ltd., and Eastern Canada Gas & Oil, Ltd.

The lowlands of Quebec are those low-lying regions roughly bisected by the St. Lawrence River between Montreal and Quebec. In the vicinity of Montreal the width is about 60 miles; this can be regarded as the base of a long, narrow triangle wedging out at Quebec about 200 miles to the northeast. The area includes about 5,000 sq. miles, bounded on the north by the pre-Cambrian hills of the Canadian shield, and on the south by the thrust slices of the Appalachian Mountain system.

Topographically the region is a plain broken only by a few isolated intrusives east of Montreal, but this plain is a result of both erosion and postglacial filling, and bears little relationship to the underlying structures.

A report on the lowlands of the Geological Association of Canada states that "this region is underlain almost entirely by rocks of Ordovician and Cambrian age, the total thickness of which reaches about 8,000 ft. . . . comprised of about 75 per cent limestones and dolomites, 21 per cent shales, and 4 per cent sandstones . . .

"The basin to the east of Montreal is regionally a broad synclinal structure with a northeasterly trend, and



SURFACE MAP of areal geology in the Lowlands of the St. Lawrence River area. Fig. 2.

contains mostly marine limestone, dolomites, and shales with some sandstones. The sediments appear to have been laid down in shallow water as shelf or foreland deposits characteristic of a subsiding basin. The nature of the later Ordovician sediments seem to indicate a progressive sinking of the basin. Anticlines, faults, lenticular sandstone beds, and the northeastward wedging out of some of the formations are present, and may be suitable traps for the accumulation of oil and gas."

Adding to this, the surveys of Eastern Canada Gas & Oil, Ltd., postulates that another major geological feature of the region is the Delson fault. This fault separates the main part of the synclinal basin from an extension southwards from the fault stretching 50 to 60 miles, and extending 15 to 20 miles across the border into Vermont. This southern portion of the basin has a prospective width of 14 miles and, when taken into consideration with the relatively simple major folding in this region, holds the promise of substantial reservoirs of oil and gas.

The Geological Association report adds that "there is direct evidence of the presence of oil and gas, either as seepage, or showings in wells drilled, in the Potsdam (Upper Cambrian) and in the Ordovician formations, the Beekmantown, Black River - Trenton, and Lorraine."

Background

The first mention of natural gas in the lowlands was made in a geological report of 1863 when it was noted that "numerous springs . . . give off great volumes of gas which keep the waters in constant agitation."

In 1884, a later report recorded "very considerable emanations of combustible gas" north and south of the St. Lawrence River from Montreal to Quebec. The report concluded that "this gas certainly has an origin which should be found in petroliferous deposits in the underlying rocks. It, therefore, seems rational to suppose that there exist large quantities of petroleum from which the gas is continually being formed."

Gas utilized for years . . . From this time onward, a notable use of natural gas has been made by farmers along both banks of the St. Lawrence. Many shallow wells having supplied all farm needs for heat for over 50 years. In some cases, gas tapped with a few hours' drilling through the clay drift heats uninsulated poultry houses all year round and through winter temperatures that reach many degrees below zero.

Attempts have been made, at roughly 20-year intervals since 1880, to develop the commercial possibilities of the gas and oil potential. But almost without exception these ventures have been launched without adequate appreciation of the financial resources required for exploration and development. Drilling operations have been started without full consideration of geological factors and have proceeded without the essential technical supervision.

Early failures not important . . . The failure of these early ventures, which account for a few dozen holes in an area of 5,000 sq. miles, has little significance in the assessment of the potentialities of the region. A western Canadian oil geologist, after examining the core log of one of the deep wells, abandoned as dry, stated that with the use of modern completion techniques, this well might have been developed as a producer.

In the past 10 years Canadian experience and technical know-how have developed rapidly. In spite of the exploration activity spreading continually through the western provinces, experienced operators are now turning towards the Quebec lowlands and its possibilities.

Market Outlook

The marketing problems which have plagued development in the Canadian west do not exist in the east. The largest petroleum refineries in Canada are in Montreal, in the heart of the lowland region. Montreal, the largest city in Canada and the second largest port in North America, is a market for natural gas that has not yet been touched. Most of the large and small industries and most of the large and small cities and towns of Quebec are concentrated in the St. Lawrence Valley. There should be no question of rationing production as in the Canadian West, no question of gas wells capped indefinitely for lack of demand.

The whole lowland area is well-serviced for rail, road, and water transport. Any doubts about adequate reserves that might influence industry in making long distance plans for gas fuel supply, or converting from present fuel usage to gas, are allayed by the plans for the Trans-Canada pipeline which will bring reserves from the west to the east. The linking of two reservoirs, one from the west and a new one from the lowlands should be mutually beneficial. The eastern reserves will insure continuous supply should any failure occur in the pipeline, and vice versa.

The pipeline project will also insure price maintenance for the lowland production. The present retail price for gas in Montreal is $1.05 per M.c.f. The quoted wholesale delivery price for

CANADA—Where Oil Is King

gas from the west to Montreal is 70 cents per 1,000 cu. ft. This would probably maintain the wellhead price in the lowlands at roughly 10 times the wellhead price in Alberta for pipeline suppliers. The attraction and the possibilities of exploration in the lowland region are therefore easily understood.

Current Exploration

During the preliminary exploration of 1955, several significant discoveries were made. The five test wells drilled by Eastern Canada Gas & Oil, Ltd., showed gas production that without any final completion procedures each gave test results of over 250,000 cu. ft. per day. These were the only tests at depth but shallow hole drilling in the Three Rivers district gave direct evidence of substantial reservoirs.

A farmer drilling for water through the drift clay that covers much of the region struck gas which blew out at 1,841,000 cu. ft. per day. This well ran an open-flow test from a 2-in. pipe which increased after 11 weeks to between 4,000,000 and 5,000,000 cu. ft. per day before it was closed under the orders of the Department of Mines. This is conclusive evidence of the potentialities of the lowlands.

Great Sweet Grass Oils, Ltd., drilling a test hole near Three Rivers, halfway between Montreal and Quebec, struck gas under the drift. This well blew out at an estimated 100 psi. pressure from a 10-in. pipe for several days. The well was capped and further surveys are being taken before planning an extensive drilling program.

It is estimated that along both sides of the St. Lawrence between Montreal and Quebec there are over 200 minor wells drilled by farmers to supply farm and house needs for cooking and heating and many of these wells have supplied gas without diminution for over 50 years.

New drilling under way . . . The current year will see the most intensive program of exploration, by geophysical surveys and drilling, that this region has yet seen.

Imperial Oil, Ltd., has completed gravity meter and seismic surveys on its holdings of approximately half a million acres in the lowlands, and has commenced the drilling of an exploratory well in the vicinity of Leclercville.

Eastern Canada Gas & Oil, Ltd., holds 128,000 acres between the Vermont border and Montreal. A gravity-meter survey has been completed. Five structure test holes were drilled to depths varying from 1,570 to 4,750 ft. during 1954 and 1955. Two cable-tool rigs from Ontario will drill a minimum of four deep wells this year to a maximum depth of about 8,000 ft.

Oilmont Petroleums Corp. holdings amount to approximately 140,000 acres, part of which has been farmed out to Ocalta Oils, Ltd., of Calgary. A detailed gravity-meter survey has been completed on the island of Ile Jesus, which comprises a greater part of the total acreage held by Oilmont Petroleums Corp. and the results of this survey are being studied with the view of commencing drilling at an early date.

Oil Selections, Ltd., of Toronto, holds over 30,000 acres and is taking up a much larger area. This company has brought a Failing rig from Calgary for a test-drilling program of more than 20 holes. The first hole, less than 20 miles from Montreal, brought in gas between 400 and 500 ft. depth at 125 psi. pressure. Drilling will be continued to 1,000 ft. before production tests are completed.

Great Sweet Grass Oils, Ltd., of Calgary and Oklahoma, holds approximtely 67,000 acres. Gravity-meter surveys were completed in 1955 and two test holes drilled. One of these holes struck gas at strong pressure and it is the intention of the company to drill about 50 shallow wells to test the productive shallower sands. These wells will also act as structure test wells to outline underlying deep structures. These deep structures will be tested by large-diameter holes drilled to production or basement rock.

A number of smaller companies are active in the region and a large number of applications for concessions are awaiting approval by the Quebec Department of Mines.

Oil Rights

Throughout the lowland region the mineral rights belong to the Crown. This means that concessions for exploration for oil and gas are granted by the provincial government and application for concessions are submitted to the Deputy Minister of Mines, Department of Mines, Quebec. These applications should be accompanied by evidence of financial and technical ability of the applicant to carry out the work required.

EXPLORATION HIGHLIGHTS

July Was Record Month in Western Canada Drilling

by Tom Steele

WESTERN Canada's complete exploration and development program for 1956 will increase 10 per cent over last year, but exploratory drilling will decrease 2 to 3 per cent when all the facts and figures have been compiled, December 31.

When good weather and road conditions allowed drillers an early start some 2 months ago, Canadian oil experts were willing to predict western Canada would have its most active exploration year. Now the experts have revised their thinking. They still believe, however, that the over-all drilling program will be bigger than last year's.

Approximately 330 exploratory holes were drilled in western Canada during the first 6 months of this year. This estimate indicates about 185 of the wells in that category were drilled in Alberta and around 125 were drilled in Saskatchewan and Manitoba—most of these wells were drilled in southeastern Saskatchewan. About 20 exploratory wells were drilled in British Columbia.

Discoveries about the same . . . The rate of oil discoveries in western Can-

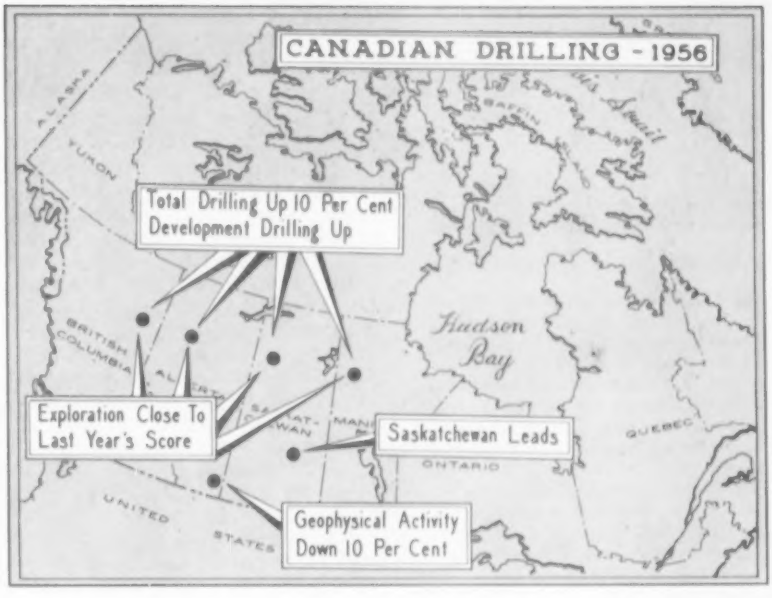
Exploration This Week

Western Canada	282, 284
Pacific Coast	286
Basin and Range	286
Appalachian	288
Eastern Interior	289
Great Lakes	291
West Texas-New Mexico	291
Rocky Mountains	292
South Texas	293
Southeastern States	294
Mid Continent	295
South Louisiana	295
Successful Wildcats	297

ada ran close to last year's mark. Indicated discoveries for the half-year reached the 77 mark, with 41 oil strikes and 36 gas strikes. For the corresponding period of 1955, the total was 78.

Although the indicated discovery rate is almost the same as last year; a number of changes are noted in the actual discovery rate in various provinces. Alberta had 18 oil finds and 31 gas discoveries for the first 6 months of this year compared with 26 oil finds and 24 gas discoveries during the same period last year.

Saskatchewan showed 21 oil finds vs. 10 oil and 4 gas discoveries in 1955. In Manitoba only two new oil discoveries have been recorded in 1956 but there were five in the first 6 months of 1955. British Columbia had five gas finds compared with eight for the first half of 1955. And the Northwest Territories had a nil score this year compared with a single discovery in 1955.



Geophysics down . . . Geophysical activity is down about 10 per cent this year compared with the first half of 1955. A survey just concluded showed that 114 geophysical parties are now working in western Canada. The total includes 110 seismograph crews and 4 gravity meters. But this figure is considerably below the 1956 high established in March, when 150 seismograph and 5 gravity meters were engaged.

Alberta operations account for about 75 per cent of the current geophysical activity. Seventy-six seismograph crews and three gravity parties are exploring that province. Operations have remained constant in Saskatchewan during the past 2 months and that province has 25 crews working. Manitoba operations remained the same with a single seismic crew working.

There are seven seismic parties working British Columbia, the same as last month. One seismic and one gravity-meter unit moved into the Northwest Territories during the past month. In addition to the conventional seismic and gravity-meter parties, two oil companies and two separate geophysical contractors, are operating a total of eight continuous velocity-logging units.

Development drilling up . . . The biggest factor contributing to a lower-than-expected exploratory-drilling program is the recent swing to development drilling. This was caused by several circumstances: (1) The rigs required to step up the over-all program just aren't available; (2) many of the smaller companies were forced to go to development drilling in an effort to get some return for their investments; and (3) Canadian banking credit restrictions implemented during recent months curtailed exploratory programs and correspondingly swung the activity to development drilling.

Saskatchewan ahead . . . The southeastern section of Saskatchewan remains the hot spot in western Canada. Besides the recent interesting wildcat activity, development drilling is being increased in that area.

Westspur pipeline has commenced operation and crude-oil producers in the general area already are feeling the good effects of an average 50 cents per barrel increase. To some, it has been as high as 60 cents per barrel.

This is good incentive for a continued development-drilling program and at the same time it stimulates wildcat drilling.

Westspur hooks up with the Interprovincial pipeline and has access to existing markets in Ontario, lakehead regions, and the midwestern section of the United States. A considerable amount of top leasing in this section of western Canada is promoting activity. Offset commitments on both Crown and freehold properties in field areas force the rapid delineation of known pools because of the mineral-rights-ownership complexity in the area.

In Alberta Pembina oil field, huge in size, is the scene of most of western Canada's development drilling. The Joffre, and Harmattan - Sundre - Westward Ho areas also show lots of field work. Development drilling presently accounts for most of the activity in British Columbia. Here gas reserves are being developed to meet the demands of Westcoast Transmission Co.'s gas line now under construction.

What's ahead? . . . Exploration activity for the balance of the year in Alberta will see considerable work in the Harmattan-Westward Ho-Sundre region. Starting about 60 miles northwest of Calgary this activity will be directed toward that city in a search for the Elkton member of the Turner Valley pay; it also will feature a Mississippian search. Some drilling is scheduled for the Pembina region, and an immediate program is beginning in the southern Grande Prairie region.

Looking ahead a few months, the approach of winter and freezeup will swing exploration-drilling activity into the far reaches of northern Alberta and northern British Columbia. It still appears that the Red Earth Creek region will command a big play. The granite wash discovery there started a record-breaking land play in western Canada earlier this year. This strike has been described as the most encouraging granite wash well yet recorded. During the fantastic land play that followed, some 23 million Alberta acres and 7 million Saskatchewan acres were filed on.

In the meantime some of the acreage has been released but the region will most certainly be watched closely when winter exploration begins. Throughout northern Alberta and northeastern British Columbia several wildcat ventures have been shut in and work will not start on them until the annual deep freeze makes transportation possible. Much of the impassable country is in muskeg.

Manitoba's exploration activity has been slight this year and it probably will remain at that level for the balance of the year.

Specialized Experience

in the creation of plastic organic coatings is the key to success in the protection from corrosion of offshore drilling structures and floating equipment. As early as 1947, when the offshore search for oil began, PRS supplied a vinyl coating system for a drilling platform. And since that time PRS has constantly studied the requirements of this most exacting of corrosive environments. PRS has developed coatings for structures for most of the companies operating offshore since 1947.

Specialized coatings, including plastic mastics, have been tailored to meet specific offshore drilling and production conditions. Conservatively speaking, PRS is today a leading supplier of protective coatings in the offshore field. We invite comparison of our record with that of any other manufacturer.

Experience has shown that ALL OF THESE REQUIREMENTS must be completely satisfied if Long Term Protection is to be gained by a protective coating:

Covering Properties—
Water Resistance—
Caustic Resistance—
Solvent Resistance—
Abrasion Resistance—
Maintenance—
Facility of Application—

PRODUCTS RESEARCH SERVICE, INC.
BOX 6116 • NEW ORLEANS 14, LA.

Products Research Service, Inc.
Box 6116 • New Orleans 14, La.

☐ Please send me copy of your new brochure entitled SURFACE COATINGS FOR OFFSHORE STRUCTURES.

☐ I have corrosion problems other than those associated with offshore. Please send me SURFACE COATING SYSTEMS BOOK, which details those systems most often recommended by PRS for a variety of corrosion requirements.

Name _____

Company _____

Address _____

City _____ State _____

Position _____

WESTERN CANADA

ALBERTA

Another Gas Discovery In Southeast

Tennessee Gas Transmission Co. this week reported another gas discovery in the southeast sector of Alberta on the large farmout block it acquired from Mobil Oil of Canada, Ltd. The company's new strike was reported in the Chancellor district, at its T.G.T.-Mobil-C.P.R. 26-1 Chancellor exploratory venture. Basal Colorado zone drill-stem test yielded gas at maximum daily rate of 4,400 M.c.f. daily. This discovery is 2 miles north-northwest of the Leduc Consolidated 1 Chancellor Cretaceous oil discovery well and 21 miles south-southwest of Drumheller city.

Chancellor 26-1, on LSD 11, 26-25-21w4, tested the basal Colorado interval 4,435 to 4,480 ft., with valve open 25 minutes. Gas flowed to the surface in 1 minute and reached the maximum rate of 4,400,000 cu. ft. daily in 20 minutes. There was no fluid recovery in the pipe.

Crew on the drilling rig employed at the hole resumed drilling operations after this discovery was made and carried the well to a total depth of 5,150 ft. Production casing has been set and production tests will be carried out at a later date to fully evaluate the find.

Dual Gas Discovery Reported Near High Prairie

Another Alberta wildcat driller, wholly owned by Imperial Oil, Ltd., has discovered gas in both the Cadotte and Bluesky horizons, according to an official release from that company. Flow rates of 2,500 and 5,400 M.c.f. daily were recorded on drill-stem tests and crew is now carrying the well down to lower objectives. This dual zone strike, in the High Prairie area of northwestern Alberta, on LSD 11, 18-72-17w5, is 6 miles southeast of the Great Plains-Triad-Muskeg 1-9 Gilwood granite wash oil discovery well and is about 14 miles south-southwest of High Prairie town.

Imperial 11-18 West Prairie, encountered the Cadotte at 2,560 ft. and Bluesky zone was topped at 3,625 ft. Cadotte zone drill-stem test was of the interval 2,530 to 2,600 ft. After the valve was open for 2 minutes gas flow rate had reached a maximum of 2,500,000 cu. ft. daily. Next interval tested, between 3,617-52 ft. was in the Bluesky horizon. Maximum gas flow rate was measured at 5,420,000 cu. ft. daily. Pipe recovery showed 60 ft. of salt water.

INCREASE PRODUCTION

CLEAN OUT CHOKING SAND

Excessive sand and sediment holds back your oil. For fast, easy clean out with fewer round trips and less downtime, use world famous Miller Sand Pumps.

Write for descriptive price list.

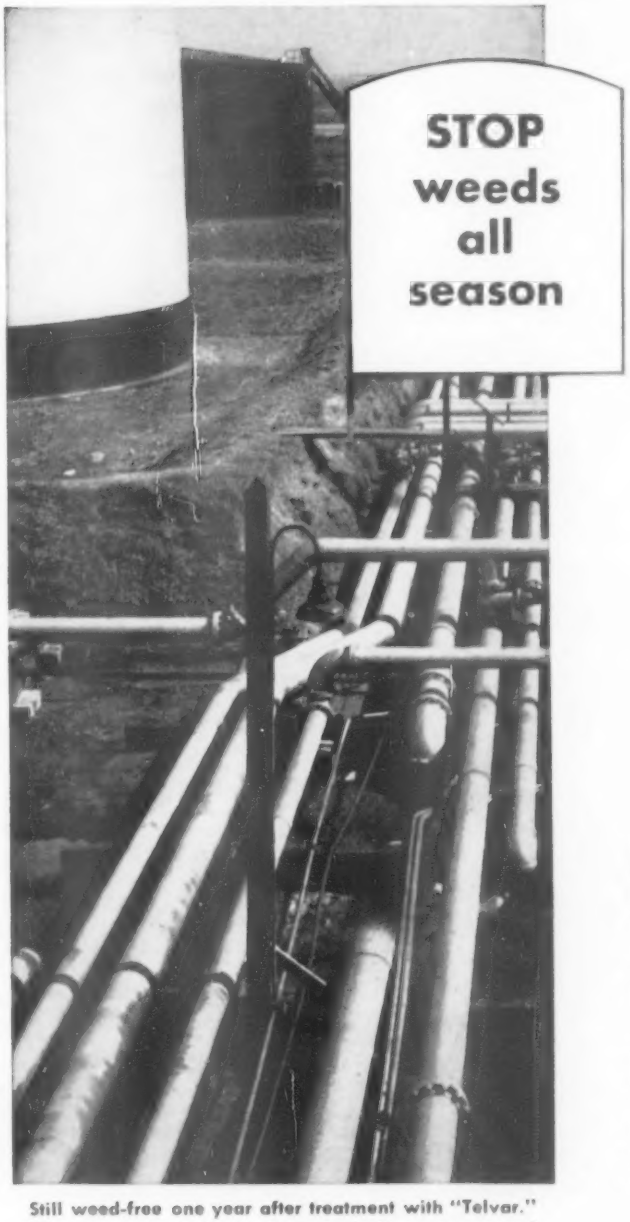
SAND PUMP SIZES IN STOCK
O.D.—2⅛, 3, 3½, 4¼, 5, 5½, 7 in.
Lengths—20, 25, 30 ft.

Composite Catalog Page 3369

MILLER SAND PUMPS

MILLER SAND PUMP CO.
General Offices, Box 4516
Oklahoma City 9, Okla.
EXPORT OFFICES
30 Rockefeller Plaza
NEW YORK 20, N. Y.

IN THE OIL CAPITOL OF THE WORLD ... and THE WATER CAPITOL OF WEST...
Business and... Pleasure in TULSA means....
Completely AIR CONDITIONED
THE MAYO
TULSA'S world famous HOTEL
ADJACENT MAYO MOTOR INN
L.D.
Phone 381



Still weed-free one year after treatment with "Telvar." The area around the tanks and pipeline was sprayed with a single treatment of "Telvar" a year before this photo was taken. Weed-control costs are cut with "Telvar" because it gives thorough, long-term weed control.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. Write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, 80 Richmond Street West, Toronto, Canada.

Spray just once with Du Pont TELVAR®

WEED KILLERS

When you use "Telvar" weed killers, vegetation is killed through the roots and regrowth is prevented because the chemical remains in the soil . . . provides residual action all season long. And low dosages (1 to 1½ lbs. per 1,000 sq. ft.) make it cost little for the results you obtain. Such low rates also mean less handling, less use of storage facilities.

"Telvar" weed killers come as wettable powders, are non-corrosive, non-flammable, non-volatile, low in toxicity to humans and livestock.

Include "Telvar" weed killers in your weed-control program this year. Prove to yourself how these products of Du Pont research can help cut your maintenance cost to new low levels.

• • •

Where brush is a problem, Du Pont Ammate® X weed and brush killer is the product you need. It kills more kinds of brush with unusual safety. With ordinary precautions, "Ammate" X may be used close to such crops as cotton, tomatoes, soybeans and peanuts.

On all chemicals, follow label instructions and warnings carefully.

DU PONT
REG. U.S. PAT. OFF.

WEED and BRUSH KILLERS

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

WALLACE & TIERNAN INCORPORATED
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY
In Canada, Wallace & Tiernan, Ltd. — Toronto
A-118

ELECTRO RUST-PROOFING
CORPORATION
30 MAIN STREET, BELLEVILLE 9, N. J.

PACIFIC COAST

CALIFORNIA

Two Prolific Producers Boost Bridge Area

Two recent completions, both within 2 hours of each other, added nearly 1,800 bbl. of crude production daily to the hot South Mountain-Bridge area in Ventura County.

The larger was The Texas Co. 1 Texas-Union-Yale-Richardson. It was brought in flowing 1,131 bbl. daily of 32.6°-gravity crude from 6,034-6,466 ft. and 6,770-8,080 ft. through a 24/64-in. choke. It total depthed at 8,325 ft. and then was plugged back to 8,080 ft. It is located northeast of the Bridge area discovery well in 14-3n-21w.

The same day Shell Oil Co. offset Texaco production with a dually completed well, 1 Saticoy, good for a total of 603 bbl. daily. The upper sand at 6,267-6,467 ft. in this northwest extension was flowing 224 bbl. daily of 33.6°-gravity crude through a 16/64-in. choke. The deeper zone at 7,468-7,948 ft. was flowing 379 bbl. daily of 34.1°-gravity crude, also with a 16/64-in. choke Total depth is 8,760 ft.

Devils Den Discovery Offset Appears Bright

Bandini Petroleum Co.'s first offset to its recent new fault block discovery in the Alferitz anticline of Devils Den field, Kern County, gives promise of being a better well than the discovery, 3 U. of C. This offset, 4 U. of C, located 200 ft. south of 3 U. of C, has 380 ft. of oil and gas sand according to the electric log and is 50 ft. higher on structure than the discovery. It also has 50 ft. of the same sand which flowed gas at the rate of 4,500 M.c.f. daily from only 20 ft. in 3 U. of C. The discovery was completed for 200 bbl. daily of 43.5°-gravity crude through a 10/64-in. choke from 3,553-3,646 ft.

BASIN AND RANGE

NEVADA

Nevada Activity

Three wildcats were under way in Nevada, highlighted by Shell Oil Co.'s 1 Diamond Valley in Eureka County. It was drilling ahead at 2,865 ft. in NE NW 30-23n-54e. U. S. Oil Co. was cementing 7-in casing to bottom in its 1,489 ft. wildcat in the Arden Dome region west of Las Vegas in Clark County, southern Nevada. West End Opoteca Mines Co. was moving

OPENS UP THE TOUGH ONES

HALLIBURTON'S

BIGFRAC

It takes more than a shove to make reluctant formations turn loose greater, steadier *volumes* of gas or oil . . . over longer periods of time. It takes a big jolt with bigger volumes of fracturing fluid at much higher rates. And that requires equipment with extra power and capacity. That's how Halliburton's BIGFRAC *delivers the pay-off punch.*

RELEASES PENT-UP PRODUCTION

BIGFRAC has substantially increased production from many gas and oil wells that have high total potential but are low in productivity. By creating more effective fractures, Bigfrac turns potential into pay-off in many different locations and types of formations.

BIG CAPACITY DOES A BIG JOB

Halliburton uses giant-size equipment to do a giant-size job. Thousands of horsepower drive high capacity sand proportioners and booster pumps, with tanks and wellhead connections to handle thousands of gallons of fracturing fluid and thousands of pounds of sand at rates up to 75 bbl/min. Continuously variable ratio controls provide accurate proportioning throughout the fracturing process.

High-volume Bigfrac jobs may sound expensive, but they actually cost less than you'd think—especially where the use of Halliburton's Sandoil or Vis-O-Frac is feasible—and that covers a lot of territory. Get maximum production from reluctant reservoirs with Bigfrac—the large-scale fracturing job with the pay-off punch. Call your local or district office of the Halliburton Oil Well Cementing Company.

COMPLETE DATA SENT ON REQUEST

Add this valuable information to your Halliburton Service File

HALLIBURTON FRACTURING SERVICES

250 SERVICE CENTERS—JUST MINUTES AWAY FROM ANY WELL

"Wherever there's oil you'll find Baird products on the job."
ALWAYS AVAILABLE THROUGH YOUR SUPPLY STORE
Baird
MANUFACTURING COMPANY
P. O. Box 380
TULSA, OKLAHOMA
CLEANOUT TAPS and DIES by BAIRD
for . . . tubing 2 in. to 4 in. plain or EUE — round or V-threads.
TUBING
for . . . all API and old style rods.
SUCKER RODS
for . . . piston rods, cross heads, valve cover and head studs.
SLUSH PUMPS

in equipment to drill a wildcat in White River Valley, Nye County. Drill site for this test is in NE NE 28-11n-60e. Moapa Oil & Gas Co. 1 Logandale, also in Clark County, was standing idle at 570 ft.

APPALACHIAN

PENNSYLVANIA

In Armstrong Township, Indiana County, Southwest Pennsylvania, Columbian Carbon Co. 1833 Susie Yosurack wildcat, has moved in the rotary outfit to resume drilling and is at 2,650 ft.

- In Brush Valley Township, 1836 I. R. Smith, shut down at 1,826 ft., for rotary.
- Young Township, Manufacturers Light & Heat Co. 4336 Stewart & R. & P. Coal Co., started up again and is at 7,459 ft.
- Mount Pleasant Township, Westmoreland County, Peoples Natural Gas Co., is moving in rig to clean out 4092 J. G. Mailey, which has been shut down at 7,476 ft.

WEST VIRGINIA

Plymouth district, Mercer County, West Virginia, United Fuel Gas Co. 8422 F. H. Cheatwood, shut down at 1,876 ft., to clean out after shot. The Maxon sand was at 1,490-1,635 ft., with gas shows at 1,490 ft. and 1,562 ft.

- Dry Fork district, Randolph County, Nelson W. Taylor, 1 H. R. Tingler, elevation 2,914 ft., reached the Chert at 5,898 ft., Oriskany sand 5,994 ft., and is fishing at 6,090 ft. Hope Natural Gas Co. 9986 W. V. Evergreen, elevation 3,023 ft., topped the Chert at 4,695 ft., and is drilling at 4,775 ft.

EASTERN KENTUCKY

On Miller Branch in Breathitt County, United Fuel Gas Co. have a dry hole at their wildcat 1 Kentucky West Virginia Gas. Significant markers include: Mississippian Big lime 1,384 to 1,600 ft.; Berea sand 1,912-60 ft. and Corniferous lime 2,345 to 2,532 ft. At a total depth of 2,591 ft. well gaged only 26,000 cu. ft. of gas daily after being shot in several zones. Test is scheduled for abandonment.

OHIO

Slagter Producing Co. went into the old field north of Wooster and completed a well on 1 (2) Carl Weinman, Section 9, Wayne Township, Wayne County. Cilnton was logged at 3,358-93 ft. and gaged 1,600,000 cu. ft. gas and 35 bbl. of oil in a 24-hour test after fracture.

MURPHY SAFETY SWITCHES
PROTECT UNATTENDED PUMPING EQUIPMENT
By Automatic Shut-Down
. . . when tank is pumped out, line breaks or leaks, lines "paraffin up" or remote valves are closed.
ONE ACCURATE LOW-COST INSTRUMENT
REGULAR -45 SERIES
For distributor, magneto or dual magneto engines. Prices start at $32.50.
Approved for use in Canada.
E-45 SERIES
Same accurate gauge and safety protection for electric motor powered equipment. Prices start at $37.50.
Specify TR-220/440-24 Relay assembly for 220V or 440V operation. Price $29.95.
Sold by Engine Dealers and Supply Stores
FRANK W. MURPHY Manufacturer
BOX 1476 TULSA, OKLA.
BRANCH LOS ANGELES 41 CALIFORNIA

EMPIRE SAND SAMPLE ENVELOPES
Specially designed and manufactured for storing sand samples. They will last and serve for years. Immediate delivery of any quantity.
PRICES AND SAMPLES ON REQUEST
32# KRAFT RUSTPROOF FLEXIBLE METAL TIE
CORE BOXES
Corrugated boxes for storing Empire Sand Sample Envelopes manufactured to fit your specifications. Inquiries for any size and quantity solicited.
TULSA PAPER CO.
P. O. BOX 30 TULSA 1, OKLA.

Write or Wire
for Monthly Stock Lists
VALVES
PRESSURE TUBING
STEEL
Peerless Supply Co., Inc.
L. D. 75 & 76 P. O. Drawer 36 A
Shreveport, La.

A north offset to the 1 E. L. Robison, Mutual Oil & Gas 1 Sam Decker, Lot 34, Hopewell Township, Muskingum County, proved to be a nice producer. Clinton was found at 3,111-49 ft., and gaged 255 bbl. in 24 hours after fracture.

- In the active pool at Spring Mountain the Ditch and Hanna 1 L. B. Reiss, Section 9, Monroe Township, Coshocton County, gaged 350,000 cu. ft. gas and 80 bbl. oil after fracture from Clinton at 3,402-50 ft.

EASTERN INTERIOR

ILLINOIS

Four oil fields were discovered in Illinois in July, according to the State Geological Survey division of the Department of Registration and Education. They are Germantown East in Clinton County, Mount Vernon North in Jefferson County, Tamaroa West in Perry County, and Pankeyville East in Saline County.

Two extensions were completed to the Cooks Mills Consolidated pool in Coles County and one each to Divide West in Jefferson County and Stanford South in Wayne County.

In July, 365 wells were completed, an average of 91 per week, as compared with 80 per week in June. Although the steel strike was expected to reduce the number of wells drilled, there has been no reduction yet in drilling and this year remains ahead of 1955.

Daily average production for the month was estimated at 229,000 bbl., with an estimated total for the month of 7,100,000 bbl. Production for the first 7 months of 1956 has been running slightly higher than during the same period in 1955.

The most active drilling area remains in Coles and Douglas counties near Cooks Mills. Douglas County tied with White County for first place in number of wells drilled in July. Each had 30 wells. In 1955 only 12 wells were completed in Douglas County during the entire year. Coles County had 19 completions in July, most of them in the Cooks Mills area. Many of these wells have initial productions of several hundred barrels per day. Twenty-six producing wells were completed in the Cooks Mills Consolidated pool and six in the Bourbon pool; about 35 more locations had been made or wells started in the two pools at the end of the month.

New Hardinsburg Pool in Saline County Indicated

Hardinsburg oil production is indicated in a discovery by Calvert Drilling and E. E. Rehn in the Harco area,

"Varec" AUTOMATIC TANK GAUGES

MAGNETIC DRIVE for HIGH PRESSURE PETROCHEMICAL SERVICE

FIG. NO. 2500C

When you buy automatic tank gauges for petrochemical service – accuracy and safety are important requisites. "Varec" offers you both. Accuracy is assured by counter and dial reading, clear and distinct–without the danger of parallax or difficulty of reading a scummy tape. Dependable safety is insured by the magnetic drive rotating the counter and dial reading mechanism. Remote Gauger Transmitter or other auxiliary equipment. Prevents pressurizing sight glass chamber or transmitter housing. Isolates both from corrosive or dangerous tank vapors. Sight glass is kept clear without use of wiper. No danger to personnel by possible glass breakage.

In addition to these exclusive features, the Fig. No. 2500C and Fig. No. 2500CR have a host of advantages:

1. Neg'ator motor for motive power.
2. S.S. type 316 sheaves.
3. Shielded type 316 ball bearings.
4. All parts either 316 S.S. or pure aluminum – natural electrical ground – no plastics.
5. Gravity compensator for product change.
6. Built to API Standard 2500 for custody transfer.

FIG. NO. 2500RC

"Varec" Fig. No. 2500C is designed for gauging liquid level of chemicals stored in high pressure spherical tanks. Gauge head has heavy carbon steel flange to permit bolting for high pressure service.

"Varec" Fig. No. 2500CR is an inverted design of the Fig. 2500C, permitting its use on all tanks, below or above ground, where top readings are required. Stainless steel tape connects from gauge head to float in a straight line, eliminating use of sheaves and brackets, thus reducing friction and promoting greater accuracy.

Both types are available in two operating pressure ranges: 150# p.s.i.g. and 300# p.s.i.g. These are only two of a wide variety of "Varec" Automatic Tank Gauges. All are designed to be combined with "Varec" Electronic or Pulse Code Telemetering equipment, remote gauging, temperature transmission, automatic tank switching, and remote controls.

Send for "Varec" Bulletin CP-3007 for information on the entire line of gauging equipment.

961.15

THE VAPOR RECOVERY SYSTEMS COMPANY

"Varec"

Compton, California, U. S. A.

Cable Address: Varec Compton Calif., (U.S.A.), All Codes

Unbeatable

for fast, clean pipe or conduit cutting . . .

efficiency-balanced

RIDGID

Heavy-Duty

Pipe Cutter

It's a tool that knows its business, that comes to your hands like an old friend. It rolls easily through any pipe or conduit, scarcely a trace of burr. Strongly built, guaranteed not to warp or break, always tracks perfectly. Thin-blade or heavy-duty cutter wheels (special wheels for stainless or cast iron). For pipe or conduit cutting that's a satisfaction, buy RIDGID's at your Supply House.

7 models for ⅛" to 6" pipe and conduit

RIDGID 4-WHEEL for easy cutting in tight places

RIDGID

Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.

EVERY WELLDIGGER SHOULD HAVE THIS FREE BOOKLET

This new Martin-Decker booklet contains a wealth of information about drilling-control instruments vital to every driller, tool-pusher, engineer, oil operator, and contractor. This is not a mere catalog of gauges for sale, but a genuinely instructive handbook that, with photographs, schematics, and non-technical language, explains the workings of instruments and the parts they play.

Write for Bulletin P-61, Martin-Decker Corporation, 3431 Cherry Ave., Long Beach 7, Calif.

MARTIN-DECKER CORP.

HOME OF THE WEIGHT INDICATOR — LONG BEACH, CALIFORNIA

western Saline County. It is more than 10 miles from any other production from that sand.

Their prospective discovery well, 1 Calvin Brown heirs, in 22-8s-5e, had 50 ft. of gas, 190 ft. of clean oil, and 70 ft. of mud-mixed oil in a 2-hour drill-stem test at 2,322-52 ft. in Hardinsburg sand. Bottom-hole pressure registered 860 psi.

The pay has been passed up for the time being for a look at potentially productive lower horizons.

Edwards County Gets 3-Pay Producer

Skiles Oil Corp., 1 Feiber, near Cowling, Edwards County, completed in the Cypress, Aux Vases and Rosiclair formations. Production was at rate of 186 bbl. per day when put on the pump. This is a 1-mile stepout southwest of a pool that has been producing since 1944-45. Skiles has substantial undrilled acreage around the discovery.

Illinois Permits Drop

Drilling permits issued during July by the Oil and Gas Division of the Illinois Department of Mines and Minerals totaled 490, B. H. Schull, director, reports. Of these 410 were for oil wells. The remainder were no-fee permits. In July 1955, there were 420 oil-well and 144 no-fee permits.

GREAT LAKES

MICHIGAN

An interesting and important Berea sand oil pay was drilled and tested off the west edge of the original (now abandoned) Birch Run Berea oil pool, Saginaw County, at Gallher & Bachelder 1 Wolohan estate, et al., NE NE SE 19-10n-6e, Birch Run Township.

Berean sand was topped at 1,535 ft. Effective oil pay was drilled between 1,539-55 ft. Well swabbed an average of 8 bbl. of oil a day natural from this pay—a very encouraging amount of oil to be recovered from the Berea on natural tests. Well was being drilled below 1,900 ft. headed for the Dundee oil pay zone which is now under test in the Birch Run pool. This Berea pay may be retested at a later date. This new well is located about ½ mile west of the original Berea oil pool and likewise about the same distance from the current Dundee development below the old Berea field.

Ohio Oil Co. logged an upper Detroit River, sweet oil pay in Headquarters field, Roscommon County, at the A-5 State, N½ SW SE 33-21n-3w. Well was reported to be flowing oil by heads from upper Detroit River pay at 4,278-88 ft. after 18 bailers of free oil were recovered off the top of a hole full of water previously. The A-5 State is an older Traverse oil producer in the Headquarters pool which is being deepened to the Detroit River and Richfield. This may be a new pay discovery. Well is the first in the pool to log this upper Detroit River sweet oil pay. Producers in the area were watching developments closely. Since the recent price penalty on sour, high sulfur content oil, the bulk of the deeper production in Headquarters, activity in the pool has been at a virtual standstill. Most of the previously-drilled deeper pay wells in the area have been drilled with rotary tools and this particular upper Detroit River pay was either missed in these earlier wells or was not recognized and tested as drilling was continued to deeper objectives. This well may reactivate drilling in Headquarters.

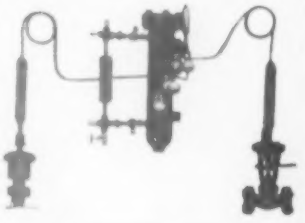
WEST TEXAS-NEW MEXICO

WEST TEXAS

More Devonian Oil Showing In Ector County Wildcat

Magnolia Petroleum Co. 1 Sallie W. Ratliff, long testing Devonian pros-

ACCIDENTS
don't just happen—
they are CAUSED!



INFERNO Automatic Safety Units will give you dependable protection against explosions and the burning and dropping of crown sheets. Write now for your FREE copy of Bulletin 15-C giving full information.

THE INFERNO CO.
Box 1138A
115 RICOU St.
SHREVEPORT, LA.

For Safety Unsurpassed
KELCO Safety SPINNING LINE and BREAKOUT CATHEADS

The Model 12 Non-Fouling Cathead

THE OUTSTANDING CATHEAD OF TODAY AND TOMORROW

Anti-Fouling Cutline Spool
Completely Housed Friction Cathead
Simplicity of Design, Operation and Maintenance
Double-Plate Clutch
Anti-Friction Bearings Throughout as Recommended by Leading Bearing Manufacturers
Choice of Mechanical, Hydraulic or Air Controls

AVAILABLE THROUGH YOUR FAVORITE SUPPLY STORE
Representatives in All Fields
EXPORT REPRESENTATIVE—Val R. Wittich, 30 Rockefeller Plaza, New York, N. Y.

Be Safety Wise — KelCo-ize

KELCO BEN F. KELLEY CO., Inc.
TULSA, OKLAHOMA

SPINNING LINE CATHEADS • BREAKOUT CATHEADS • AIR OPERATED POWER SLIPS
TUBING TONGS • SAFETY "C" POLISHED ROD CLAMPS

pect 5 miles northeast of Odessa, looked like it might make a well in the Devonian.

Operator swabbed 7 bbl. of oil from perforations at 12,130-12,208 ft., then treated with acid. Following treatment the well kicked off and flowed 43 bbl. of new oil in 6 hours through 12/64-in. choke, plus 11 bbl. of acid water. Gas-oil ratio was 2,530:1 and tubing pressure was 200 psi.

Location in 38-42-T1S-T&P Survey is the so-called Headlee trend of eastern Ector County and northwestern Midland County.

Devonian outpost set . . . White Eagle Oil Co. and Freeport Sulphur Co. have made location for a ½-mile east offset to their recent Devonian discovery, the 1-32 Edwards ranch, in southern Ector County.

The second test is 1 Edwards-Brown, located in the northeast quarter of Section 32, Block 43, Township 3 South, T&P Survey. Projecteed depth is 14,000 ft., which should test the Ellenburger.

White Eagle and Freeport Sulphur 1-32 Edwards ranch turned in a completion potential of 555 bbl. of oil daily through 38/64-in. choke, from perforations in the Devonian between 11,989-12,151 ft. This well also tested the Ellenburger at 13,342-70 ft. but failed to develop commercial production.

ARCCO
ARCCO-Anubis
LIQUID GRAVITOMETER
For PIPELINES, REFINERIES, GASOLINE PLANTS
NOW 19 MODELS
MODEL R
This ruggedly built instrument of laboratory accuracy is ideal for quick checking and for continuous recording of Specific Gravity of liquids under line pressure. Changes in Specific Gravity of sample are recorded with a very minimum of time lag. Foreign liquids and gases are automatically purged from sample. No moving joints or stuffing boxes to cause friction or leakage. Temperature corrected, this precision instrument is adaptable to high pressures. Hundreds are in daily use in plants and refineries of major companies. Available in 19 Models for Recording, Signalling, Transmitting and Controlling. Send for Bulletin 111R-3.
AVAILABLE FOR EARLY DELIVERY
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. Los Angeles 23, Calif.
Send for Bulletin 111R-3

Irion County Active With Strikes and Prospects

Second pay . . . Atlantic Oil & Refining Co. 3 Noelke has added a second pay, the San Angelo sand, to Sixty-Seven (Strawn reef) field which lies 7 miles southwest of the town of Mertzon, in Irion County.

On potential the well flowed 111 bbl. of 35° oil a day through ½-in. choke, from perforations in the San Angelo (just above the Clear Fork, of Middle Permian age) at 1,632-40 ft. Gas-oil ratio was 633:1. No. 3 Noelke was originally drilled by British-American Producing Co. to 7,425 ft. It found the Strawn dry and was taken over by Atlantic. Mertzon field, 1 mile to the north, has production in the San Angelo sand.

A second pay has been indicated at the 1 well Lucky-Mag field, 1 mile northwest of Mertzon. Phillips Petroleum Co. 1-A Nutt, Section 41, L&SV Survey, flowed better than 17 bbl. of oil in 1 hour while drill-stem testing at 3,418-74 ft. The section had not been identified, but was thought to be the San Angelo or the Clear Fork. Drilling continued, on 6,800-ft. contract.

Discovery prospect . . . Stanolind Oil & Gas Co. 1 Sugg "A," wildcat 6 miles north of Mertzon, identified the section tested at 5,825-53 ft. as the Wolfcamp. A 3-hour test on the section recovered 430 ft. of 37° oil plus 20 ft. of oil and gas-cut mud. Bottom-hole flowing pressure was 160 psi. Operators cored ahead following the test, and will drill to the Ellenburger expected at 8,200 ft. Stanolind owns full interest in the well and 5,800 acres in the area. Location is in Section 14, Block 14, H&TC.

Completed discovery . . . Sinclair Oil & Gas Co. has completed 1 Cox, wildcat 17 miles west of Mertzon in Irion County, as a Clear Fork well. Potential through 20/64-in. choke was 168 bbl. a day, from perforations at 4,160-72 ft.

ROCKY MOUNTAIN

NEBRASKA

Kimball County Discovery Reveals New "J" Sand Field

Banner Oil Co. is opening a new field in Kimball County, southwestern

Nebraska, where its 1 Gross, in 3-14n-56w, is testing favorable showings encountered in the "J" sand.

The indicated discovery well, located southwest of Kimball and about 1½ miles north of Durland field, filled 1,000 ft. of clean oil in a drill-stem test of that sand.

Interval tested was at 6,486-91 ft. Recovery was in a period of 1½ hours with flowing pressure of 300 psi.

The well is bottomed at 6,535 ft. Two dry holes have been drilled in the same section, one in 1953, and the other last year.

SOUTH TEXAS

TEXAS GULF COAST

Harris Wildcat Extends Bammel Gas Production

The Bammel gas-productive area in northern Harris County is being extended more than a mile northwest.

The extension well, 1 Hieden, drilled by Meredith & Co. and Bradco Oil & Gas Co., is rated good for 52,000,000 cu. ft. of gas daily, open-flow. Shut-in pressure is 1,532 psi. Gas carries a spray of 61°-gravity condensate with a gas-liquid ratio of 101,400 cu. ft. per barrel.

Production is from a 6-ft. perforated interval at 6,188-94 ft. in a sidetracked hole bottomed at 6,350 ft. The well's first hole was drilled to 7,615 ft., where drill-pipe stuck.

Bammel is about 15 miles north of Houston.

Encino Field Becomes Two-County Producer

Hewit & Dougherty and P. R. Rutherford have extended production of San Patricio County's Encino field northeastward across Aransas River (county line) into Refugio County, making it another two-county field.

Their extension well, 1-E Roche, on the north bank of the river, produced at the rate of 127.2 bbl. of 35°-gravity oil per day at completion from pay at 5,873-83 ft. Flow was through 10/64-in. choke with pressure of 500 psi. and gas-oil ratio of 629 cu. ft. per barrel. Total depth is 7,301 ft.

Victoria County Wildcat Indicates Gap Production

A wildcat located in the narrow gap between East McFaddin field, in southern Victoria County, and Welder Ranch field, just over the Calhoun County line, is showing for production from at

HENRY H. PARIS DISTRIBUTOR, Inc.

OIL WELL, REFINERY AND INDUSTRIAL SUPPLIES

1125 ROTHWELL ST. • P. O. BOX 732 • HOUSTON, TEXAS

Agent and Distributor for the Following Nationally Known Manufacturers:

ALTEN FOUNDRY & MACHINE WORKS
Lancaster, Ohio
Surface Equipment.

THE OHIO INJECTOR COMPANY
Wadsworth, Ohio
OIC Valves, Bronze, Iron, Cast, and Forged Steel for all purposes.

DRESSER MANUFACTURING DIV.
Bradford, Pa.
Seamless Welding Fittings.

OIL STATES EQUIPMENT COMPANY
Houston, Texas
OSECO Silvertop Fusible Plugs with renewable inserts for all types OIL COUNTRY BOILERS.

THE GORMAN-RUPP COMPANY
Mansfield, Ohio
Centrifugal Pumps.

STEEL FORGINGS, INC.
Shreveport, La.
Weld Saddles.

HARRISBURG STEEL CORPORATION
Harrisburg, Pennsylvania
Forged Steel Flanges and Seamless Welding Couplings.

VOLCANO BURNER COMPANY
Houston, Texas
Volcano Superior and Gulf States All Steel Gas Burners for OIL COUNTRY BOILERS.

LOS ANGELES BOILER WORKS
Los Angeles, California
Welding Caps—Dished & Flanged Heads.

WESTERN SAFETY BARREL STAND
Houston, Texas
Stand lifts, holds, tilts 55 gal. barrels Prevents spillage—easily loaded.

MILLS IRON WORKS, INC.
Los Angeles, Calif.
Seamless Swage Nipples, Bull Plugs & Welding Reducers.

WHEELNG MACHINE PRODUCTS CO.
Wheeling, West Virginia
XL Steel Pipe Couplings for OIL COUNTRY TUBULAR PRODUCTS.

least three sand intervals from 5,300 to 5,400 ft.

It is Monsanto Chemical Co.'s deep test on its McCan lease, in the Maria Josefa Traviesa Survey. It was drilled to 8,136 ft. but is plugged back to 6,000 ft., where production string of pipe has been run through the prospective pay zones for completion.

A 16-minute drill-stem test at 5,309½-13 ft. with ⅜-in. and ¼-in. chokes recovered 15 ft. of condensate, recording working pressure of 1,700 psi., and bottom-hole pressure of 2,190 to 2,205 psi.

A 30-minute test at 5,359-77 ft. with ¾-in. chokes got 855 ft. of oil-cut mud water cushion, 270 ft. of oil-cut mud and sand, 110 ft. of oil, and 15 ft. of salt water. Bottom-hole pressure was 1,050 to 2,175 psi.

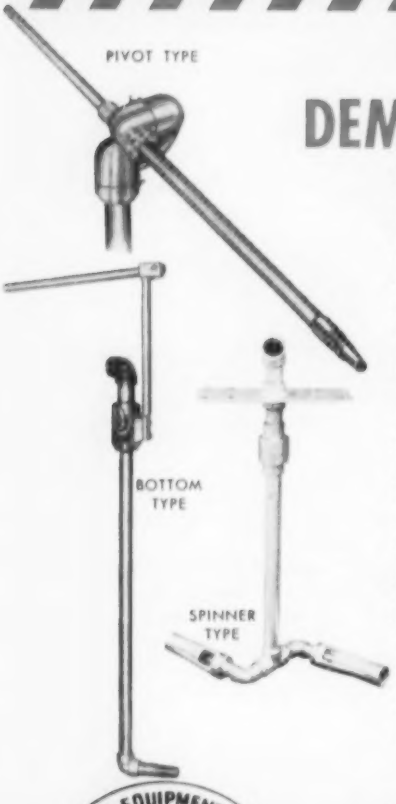
A 30-minute test at 5,403½-12 ft. with ¼-in. chokes yielded 2,100 ft. of oil and gas-cut salt water, and 320 ft. of water. Working pressure was 18 psi. and bottom-hole pressure was 1,040-2,135 psi.

Location is on the Victoria County side of the line, 5 miles northeast of McFaddin. East McFaddin field produces from sands at 3,700 to 6,000 ft. Welder Ranch's pay is at 5,900 ft.

for Proper Mud Control

there's a Proper

DEMCO MUD GUN



PIVOT TYPE

Designed to handle all mud mixing jobs, in both steel tanks and earthen pits. Spin-proof and fully adjustable to any position in both vertical or horizontal planes.

BOTTOM TYPE

Provides maximum jetting action where needed. Rugged Swivel Joint rotates on double rows of ball bearings. Swing handle has boxed joint. Replaceable, hardened steel jet nozzle.

SPINNER TYPE

Swivel joint for continuous rotation. Keeps mud rolling and weight material in suspension. Exclusive combination of jet and venturi creates multiple mixing action.

Demco Mud Guns are designed for 3,000 lbs. working pressure

Available at your Supply Store

DRILLING EQUIPMENT MFG. CO. DEMCO OKLAHOMA CITY, OKLA. U.S.A.

General Office & Plant:
Oklahoma City, Oklahoma
P. O. Box 4728
Phone MElrose 2-4475

SOUTHEASTERN STATES

MISSISSIPPI

Rank Yazoo County Wildcat Tests Paluxy Oil Showings

A Lower Cretaceous sand, probably in the basal Paluxy zone, is showing indications of production in another Mississippi wildcat. It is located in the Wolf Lake area, 7 miles northwest of Yazoo City, in northern Yazoo County, ¾ mile south of the Humphreys County line.

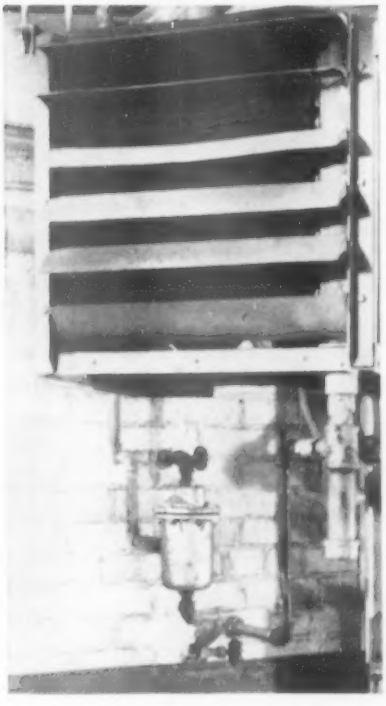
Location (indicated by arrow) of Texas Crude Oil Co.'s prospective Paluxy (Lower Cretaceous) oil discovery in northern Yazoo County.

The indicated discovery is by Texas Crude Oil Co. and Jett Drilling Co., Inc., at their 1 Cary, in 3-12n-3w. If commercial production is established, it will be the most northwesterly Lower Cretaceous or other production in the Mississippi embayment or state.

The prospective well recovered 1,080 ft. of 42°-gravity oil with 660 ft. of salt water and 120 ft. of mud in a 15-minute drill-stem test, taking in an interval at 7,408-47 ft. Test was through ¾-in. top and ⅜-in. bottom chokes with 1,000 ft. of water cushion. Top pressure was 3¼ psi. Bottom-hole pressure was 960-1,245 psi., flowing, and 3,100 psi. shut-in. The well had cored from 7,405 ft., recovering 4 ft. of fairly porous sand with good oil odor, and 26½ ft. of porous and permeable sand with good shows throughout.

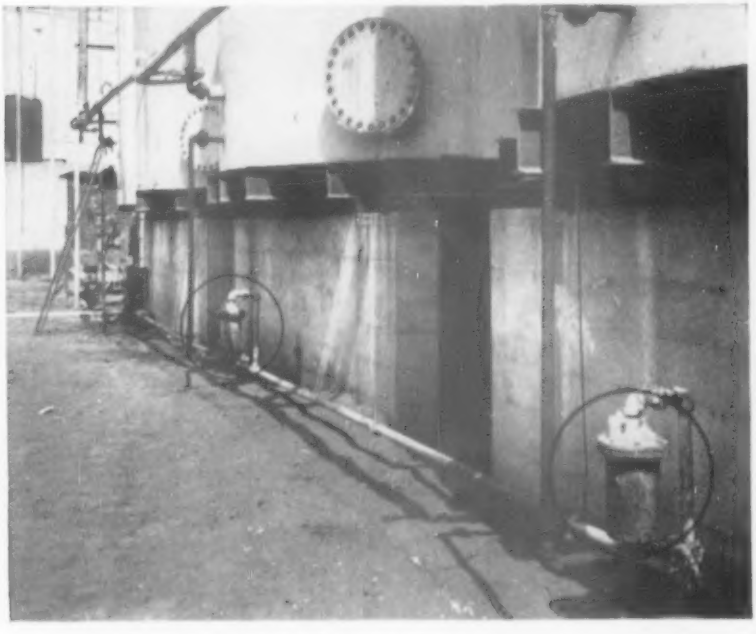
Hole was deepened to 7,646 ft., in the Glen Rose (top 7,453 ft.), without additional showings. Casing was run to 7,512 ft., and is perforated at 7,402-08 ft. for production tests. Initial testing has not been encouraging. The well failed to flow after displacing mud with water, and as this is written is swabbing, recovering wash water with a scum of oil. Operators may reperforate to take in more of the zone.

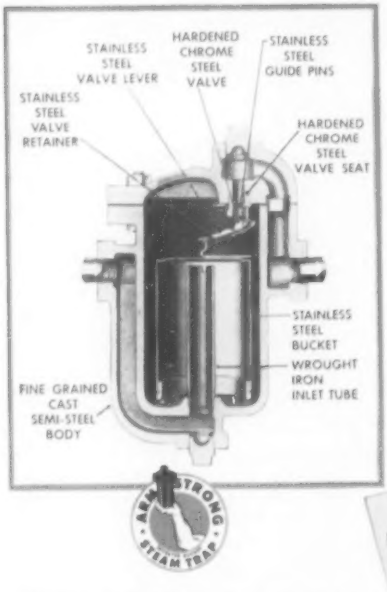
Major Chemical Company Reports Armstrong Traps Cost Less to Maintain



INDOORS—Mr. George Gentes, Works Manager at Hooker Electrochemical Co., Tacoma, Wash., says, "We feel that we get excellent service with Armstrong traps. We have been using them for about 10 years."

OUTDOORS—these Armstrong traps give year 'round service at Hooker's big Tacoma plant.




STAINLESS STEEL VALVE LEVER
HARDENED CHROME STEEL VALVE
STAINLESS STEEL GUIDE PINS
STAINLESS STEEL VALVE RETAINER
HARDENED CHROME STEEL VALVE SEAT
STAINLESS STEEL BUCKET
WROUGHT IRON INLET TUBE
FINE GRAINED CAST SEMI-STEEL BODY
ARMSTRONG STEAM TRAP

Simple, dependable Armstrong traps mechanisms have only two moving parts—bucket and lever. Design, materials and workmanship in low and medium pressure traps identical to that of traps for 900 lbs., 900°F service!

Trap's Lot is a Hard One. A steam trap takes a lot of punishment. On some jobs it may operate *1,000,000 times a year*. The parts are subjected to dirt, scale and corrosive substances, high temperatures and the erosive action of the condensate.

Armstrong's Take it Well. Armstrong traps endure these conditions remarkably well. In reporting on less trap maintenance since installing Armstrong traps Mr. George Gentes, Works Manager of Hooker Electrochemical Company's plant at Tacoma, Washington stated:

"We get excellent service . . . our trap maintenance cost is very low."

Others Agree. More Armstrong customers mention low maintenance than any other single benefit. That means more than low repair costs. It means freedom from leaky traps that waste steam, freedom from faulty traps that slow up production—freedom from *trouble*.

A Suggestion. Send for the Armstrong Catalog listed below or, better yet, call your local Armstrong Representative or Distributor—he's exceptionally well qualified to help you improve your trapping situation.

ARMSTRONG MACHINE WORKS
868 Maple Street • Three Rivers, Michigan

FREE
44-PAGE STEAM TRAP BOOK—Send for yours—no obligation.

ARMSTRONG MACHINE WORKS
868 Maple Street, Three Rivers, Michigan
Please send Steam Trap Book to:

Name_____
Company_____
Address_____
City_____ Zone___ State_____

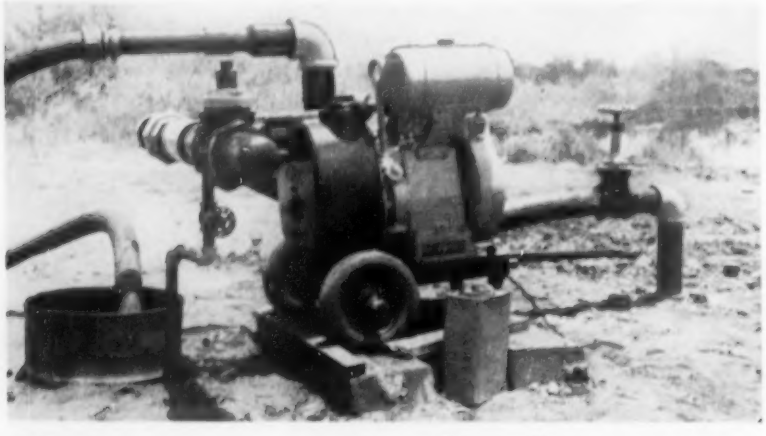
Nearest Lower Cretaceous production has been at Pickens, 25 miles east in northeastern Yazoo County, where one well, now shut-in, was completed in the Travis Peak zone in 1950. Two Lower Cretaceous-Hosston wells have produced at Virlillia, about the same distance southeast, in Madison. The location is about 40 miles north of Bolton, in Hinds County, where Paluxy sands are productive at depths of 9,900 to 10,000 ft., and Rodessa sands at 10,500 ft. Loring field, 30 miles southeast in Madison County, produces from the Smackover at 12,200 ft., the only such production in the state.

MID-CONTINENT

NORTH TEXAS

Nolan County Gets New Canyon Pool

Sun Oil Co. has completed its 1 E. Paramore "A," wildcat 2 miles southwest of Sweetwater in Nolan County, as a Canyon sand discovery. Flowing potential was 146 bbl. of 46° oil a day through 11/64-in. choke. Pay was perforated at 5,718-34 ft. Tubing pressure was 900 psi. and gas-oil ratio was 1845:1. Location is in Section 83, Block 1-A, H&TC Survey. This well was an Ellenburger test, with total depth at 7,300 ft.



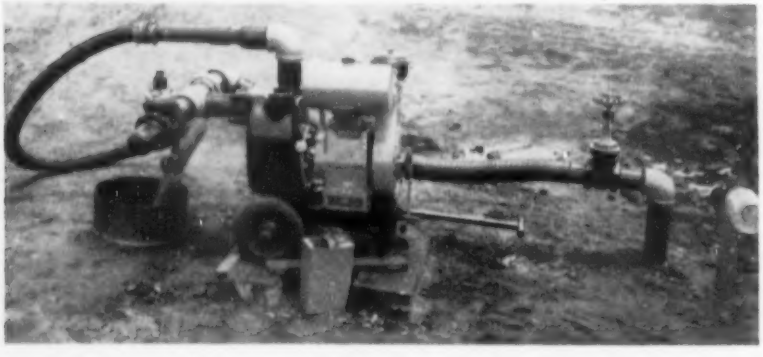
Any way you look at it—

CMC DUAL PRIME PUMPS are your best buy!

• These pumps are especially built for oil field service in a large variety of sizes and models. Each Dual Primer is a compact, ready-to-run unit that can be used for either suction lift or booster pumping. Write for latest Pump Bulletin.

CONSTRUCTION MACHINERY COMPANY, Waterloo, Iowa

Pictured above & below, CMC Model 37-N on a typical oil field gathering operation.



SOUTH LOUISIANA

St. Landry Parish Wildcat Gets Promising Oil Show

Indications of a new deep oil-productive area in southern St. Landry Parish are given in drill-stem tests Slick Oil Corp. and Harry Hurt, Inc., made in their 1 Laurent Blanchard Unit, spotted in 46-7s-5e.

Location is north of Arnaudville field, just across the line in northwestern St. Martin Parish.

Open-hole drill-stem test at 10,402-08 ft. recorded initial flowing pressure of 2,230 psi. and shut-in pressure of 2,550 psi. The test, open 20 minutes through ¼-in. chokes with 5,000 ft. of water cushion, recovered drilling mud with oil shows.

Deepening, operators logged a drilling break between 10,410-21 ft. where the well "kicked" with 14.8-lb. mud and required building weight to more than 15 lb.

Prolific Flow Recorded in Alligator Pass Discovery

Continental Oil Co.'s new discovery well in the Alligator Pass area, 20 miles down the Mississippi River from New Orleans, in Plaquemines Parish, produced at the rate of 469 bbl. of 46.8°-gravity condensate per day while testing three casing-perforated intervals from 11,494 to 11,598 ft.

Recovery was with gas flow at the rate of 4,902,000 cu. ft. per day. Testing was through ¼-in. choke with pressure of 5,425 psi. Testing continues.

Location, in 16-15s-14e, is nearly 3 miles north of Delacroix field. The well is 1 Delacroix. It was drilled to 12,106 ft.

New Lake Hatch Well Opens Deeper Gas Sand

Union Oil Co. of California is opening a deeper sand, productive of gas and condensate, in the Lake Hatch area, Terrebonne Parish.

Its discovery well, 1 LL. & E., southeast of production, is perforated at 12,040-64 ft. It flowed an ungaged amount of gas and condensate while cleaning, and has been shut in pending provision of an outlet, and potential tests. Flowing pressure was 7,000 psi. Total depth is 12,960 ft.

S.E.G. Announces Convention Plans

The twenty-eighth annual meeting of the Society of Exploration Geophysicists will be held October 13-16, 1958 in San Antonio, Tex., under the chairmanship of Weldon L. Crawford, president of Petty Geophysical Engineering Co., it was announced by R. C. Dunlap, Jr., S.E.G. president. He added that as general chairman Crawford will begin work at once on arrangements, and will soon announce the appointment of committees to assist him in conducting the meeting which is expected to attract over 2,000 of the world's earth scientists.

Dunlap also announced the completion of plans for the society's twenty-sixth annual meeting in New Orleans, October 29-November 1, 1956, under chairmanship of K. R. Wells, General Geophysical Co. He said a large number of requests for housing had already been received from members in all parts of the world. The program is based on the theme, "the S.E.G. on land and sea," with special emphasis on offshore exploration for oil.

Successful Wildcats

ALBERTA

Texaco McColl B16-16 Golconda, LSD 16, 16-41-6w5. TD 8,488 ft. Cardium oil well.

MANITOBA

Imperial-Cal. Standard 1-30 Hernefield, LSD 1, 30-1-25w1. TD 4,300 ft. Mission canyon oil well.

Hudson's Bay I Twin Dome, LSD 16, 8-22-1w5. TD 9,537 ft. Indicated Mississippian oil well.

Union-Hudson's Bay 2-24 Assinue, LSD 2, 24-73-9w5. TD 3,348 ft. Basal quartz gas well.

SASKATCHEWAN

Husky-Mic Mac-Canadian Superior 1 North Carnduff, LSD 16, 30-3-32w1. TD 3,909 ft. Mission canyon oil well.

Imperial 11-19 Kingsford, LSD 11, 19-4-6w2. TD 4,945 ft. Charles oil well.

Imperial 15-27 Kingsford, LSD 15, 27-4-6w2. TD 4,808 ft. Charles oil well.

MICHIGAN

Osceola County: Sun Oil Co. 2 Boyd, NW SE SE 20-17n-8w. AIP 81,100 cu. ft. of gas a day. Michigan Stray sand 1,481 ft., pay 1,465-92 ft., TD 4,000 ft. (dry in Dundee) PBTD 1,563 ft. Shut in gas well. (New pool.)

NORTH TEXAS

Baylor County: Oakland Corp. 1 Worley, 36-45-H&TC, 3½ miles SE Bomarton. IP 23 BOPD, ¼-in., TP 50 psi., 35°, GOR zero, pay 1,510-20 ft. TD 2,180 ft.

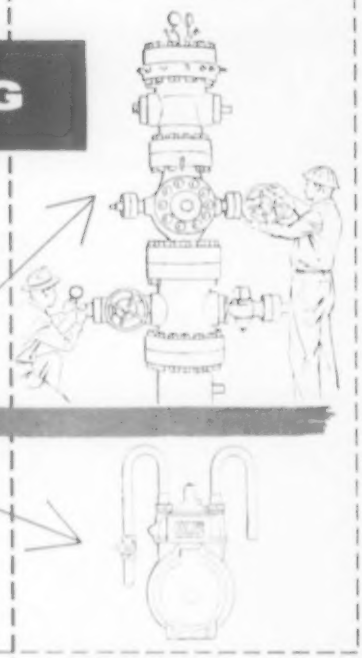
Jack County: L. T. Burns 1 Dixson C. Vandivere Sur., A-867, 3½ miles NW Jacksboro. IPP 25½ BOPD, 40°, GOR 190, pay 1,810 ft. TD 5,033 ft.

Midland Oil Corp. 3-A Dees, Moses Allen Sur., A-9, recompleted as Marble Falls conglomerate new-pay discovery in Dees

TITRILOG

. . . to control sulfur compounds and odorants all the way from here

. . . to here



Sulfur compounds at the wellhead . . . *bad*. Sulfur compounds (such as mercaptans) at the consumer's end of the line . . . *a must*. Consolidated's TITRILOG helps control them at every step of the way . . . from purchase and sale of raw gas clear through to monitoring the odorants metered into consumer distribution systems for safety purposes.

An automatic, around-the-clock instrument, the TITRILOG provides an accurate, *continuous* record of oxidizable sulfur concentrations. It is an invaluable help in controlling corrosion by monitoring treated gas before it enters transmission lines. As a double check, it is also widely used to monitor gas in transit and to ensure that H_2S concentrations are within contract limits.

For the complete story of CEC's TITRILOG, send today for Bulletin CEC 1810C-X7.

Both the stationary Model 26-102 (left) and the portable Model 26-103 (below) TITRILOGS are continuous, and highly sensitive, offer a wide range and instantaneous response. Both models report sulfur-compound concentrations as low as 0.1 ppm or 0.005 grains per 100 cubic feet. Compounds of specific interest may be separately determined.

Consolidated Electrodynamics

CORPORATION

formerly Consolidated Engineering Corporation

300 North Sierra Madre Villa, Pasadena, California

ELECTRONIC INSTRUMENTS FOR MEASUREMENT AND CONTROL

Sales and Service Offices in: Albuquerque, Atlanta, Boston, Buffalo, Chicago, Dallas, Detroit, New York, Pasadena, Philadelphia, San Francisco, Seattle, Washington, D. C.

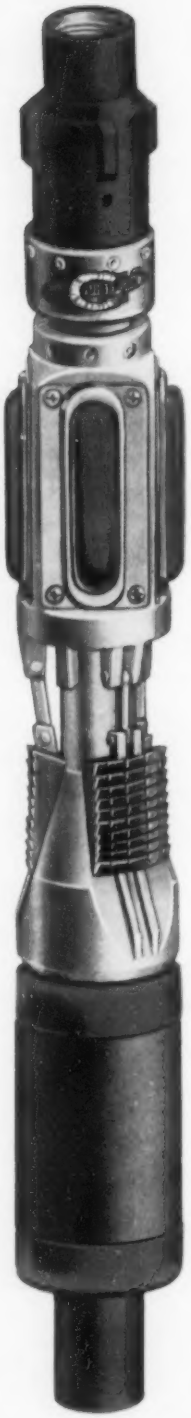
Short Length... Long Service

GUIBERSON AF PACKER

for acidizing, flooding, fracturing and other below packer pressure operations

The solid head packer you've been wanting a long time and at a price you'll be glad to pay. The AF is short, compact, strong and reliable in operation. Positive seal of pressure below the packer at any depth. Design features include friction pads, automatic latch and dove-tail slips and head. Special rubber has built-in ability to return to original shape. It will not vulcanize to casing wall and is acid, oil and gas resistant. Best of all, here is a packer you can handle—in the well or out! Over-all length of 5½" or 7" size is less than four feet!

See this packer at your favorite supply store.



THE
GUIBERSON
CORPORATION
ESTABLISHED 1919 • DALLAS, TEXAS, U. S. A.
Sold By Leading Oil Field Supply Stores Everywhere

field, 1½ miles N Wizard Wells. IP 154½ BOPD, 12/64-in., 43°, CP 390 psi., GOR 167, pay 5,367-91 ft. TD 5,561 ft.

Montague County: P-M Drilling Co. 1-B Yarbrough, J. B. Miller Sur., A-460, 5 miles SW St. Jo. Previously completed dry, old TD 7,200 ft. New TD 7,203 ft. IP 109 BOPD, 16/64-in., 41°, TP 120 psi., GOR 230, Bend conglomerate 6,642-54 ft.

Young County: Ben H. Rankin 1-F Scott, William Johnson Sur., A-159, ½ mile S South Bend, recompletion. IP 178 BOPD, 9/64-in., TP 700 psi., 40°, GOR 470, Mississippian 4,198 ft. TD 4,209 ft.

WEST CENTRAL TEXAS

Haskell County: The NY-Tex Corp. 1 Hise, 22-1-H&TC, 1½ miles SW Haskell. IPP 69 BOPD, 42°, GOR 150, pay 4,587 ft. TD 4,780 ft.

Shackelford County: Panhandle Oil Corp. et al, 1 Midkiff, Sec. 66, University Lands, 1½ miles SW Moran. IP 129 BOPD, 18/64-in., TP 140 psi., 42°, GOR 380, Upper Moran sand 2,064-67 ft. TD 3,400 ft.

Taylor County: Roy Furr 1 Edgar Brown, 54-1-SPRR, 4 miles S Buffalo Gap. IPP 59 BOPD, 37°, GOR 385, Flippen sand 2,297-2,300 ft. TD 2,339 ft.

WEST TEXAS

Crane County: Atlantic Refining Co. 1 TXL "31," 31-43-T4S-T&P, 15 miles N Crane. IPP 110 BOPD, 28°, GOR zero, Queen 4,131-51 ft. TD 4,502 ft.

Bruce & Somerville 1 TXL, 23-43-T4S-T&P, 15 miles N Crane. IPP 20 BOPD, 32°, pay 4,386-94 ft. TD 4,440 ft.

Ector County: Roy Furr 1-36 Cowden, 36-42-T3S-T&P, 15 miles SE Odessa. IPP 304 BOPD, 26°, GOR 350, pay 5,880 ft. TD 9,923 ft., PB 6,065 ft.

Gaines County: Stanolind Oil & Gas Co. 1 Oil Development Co., "F," 277-G-WTRR, 8 miles SE Denver City. IPP 349 BOPD, 38°, GOR zero, Devonian 11,933-66, 12,012-30 ft. TD 13,389 ft., PB 12,101 ft., elev. 3,460 ft.

Mitchell County: Ed's Drilling Co. 1 Otis Chalk, 91-29-W&NW, 9 miles NE Chalk. IPP 44 BOPD, 29°, GOR 300, Yates sand 1,195 ft. TD 1,209 ft.

Upton County: The Texas Co. 1 J. H. Graf NCT-4, 58-C-CCSD&RGNG, 17 miles NE Crane. IP 560 BOPD, no water, ¾-in., TP 75 psi., GOR 662, 35°, perforated Spraberry 7,744-86 ft. TD 12,363 ft., PB 7,800 ft., elev. 2,797 ft.

SOUTH LOUISIANA

Iberia Parish: Shell Oil Co. 1 Violet Landry et al 13-12s-10e. IP 166 BOPD, 9/64-in., 47.9°, GOR 452 cu. ft. per bbl., perforations 9,154-60 ft. TD 9,841 ft. (New pay in Bayou Pigeon field).

Plaquemines Parish: Stanolind Oil & Gas Co. 2 L.I.L.&E., 43-20s-28e. IP 66 BCPD and 1,545 M.c.f. daily, ⅜-in., 50.6°, perforations 12,580-90 ft. TD 13,956 ft. (New pay in West Bastian Bay field).

Continental Oil Co. 1 State Lease 1071 (OCS 0150), Block 55, West Delta area, Gulf of Mexico. IP 424 BOPD and 3,700 M.c.f. daily, 7/16-in., 47.6°, perforations 12,200-10 ft. TD 12,521 ft. (New offshore field).

St. Martin Parish. R. R. Frankel 2 Iberville, 88-7s-8e. IP 162 BCPD and 4,172 M.c.f. daily, 7/32-in., 54°, perforations 10,508-14 ft. TD 10,960 ft. (New pay in Happytown field).

Terrebonne Parish: Superior Oil Co. 1-B La-Terre, 6-19s-13e. IP 204 BOPD, 5/64-in., 34.6°, GOR 985 cu ft. per bbl., perforations 13,128-32 ft. TD 14,365 ft. (New pay in Palmetto Bayou field).

Vermilion Parish: Stanolind Oil & Gas Co. 1 State Lease 861, Block 14, Vermilion area, Gulf of Mexico. IP 118 BCPD and 4,400 M.c.f. daily, ¼-in., 49.2°, perforations 10,352-62 ft. TD 10,502 ft. (New offshore field.)

Union Oil & Gas Co. 1 Sellers, 65-12s-3e. IP 75 BOPD, 5/64-in., 39°, GOR 3,413 cu. ft. per bbl., perforations 10,-973-76 ft. TD 11,022 ft. (New pay in Abbeville field).

SOUTH TEXAS

Jim Wells County: S. H. Howell 1 Paul White Est., Block 10, Nueces County School Lands, A-334. IP 98 BOPD, ¼-in., 45.5°, GOR 12,188 cu. ft. per bbl., perforations 4,642-45 ft. (Vicksburg). TD 4,775 ft. (New field).

Charlesa Daubert 2 West, West Subd. of Block 1, Casa Blanca Grant, A-296. IP 25,000 M.c.f. daily, open-flow potential, GLR 67 M.c.f. per bbl., 56°, perforations 5,801-10 ft. (Stillwell sand), and 9,000 M.c.f. daily, open-flow potential, GLR 83 M.c.f. per bbl., 56°, perforations 5,652-67 ft. (Lou Ella sand). TD 5,843 ft. (New pay in East Sandia field).

Nueces County: Morgan Minerals Corp. 7-A Cody Est., J. H. Smith Sur. 25, A-305. IP 135.22 BOPD, 9/64-in., 25°, perforations 4,178-86 ft. (Gallagher sand). TD 4,345 ft. (New pay in Cody field).

Zapata County: Dale H. Rowden et al 2-B Fernando Cuellar, South Porcion, T.C. RR Sur. 278. Shut-in gas well, ungaged, perforations 1,554-60 ft. TD 2,110 ft. (New field).

EAST TEXAS

British American Oil Producing Co. 1 Bessie Weisenhurt, W. Tollett Sur., A-575, 6 miles NE Mineola. IP 259 BOPD, ¼-in., TP 550 psi., GOR 656, 42°, Woodbine perforations 9,217-22, 9,228-47 ft. TD

call ELGEN when you want a

"LOGGING LABORATORY"

on your well *in a hurry!*

You get consistently higher quality logs through Elgen's improved electronic equipment and techniques. Elgen field engineers are familiar with the problems of their areas and are backed by Elgen's long experienced and highly qualified research staff. Accuracy, lower price schedules and minimum rig time save you money. For fast, dependable service on your next log, call Elgen.

DIVISION OFFICES AND SERVICE LOCATIONS

☆ Wichita Falls ☆ Graham ☆ Ballinger ☆ Gainesville
☆ Abilene ☆ Tulsa ☆ Shawnee ☆ Ponca City ☆ Duncan
☆ Fort Morgan, Colorado ☆ Kimball, Nebraska

THE ELGEN CORPORATION

2925 MERRELL ROAD, DALLAS, TEXAS

11,490 ft., PB 9,390 ft. Top Woodbine 9,215 ft., elevation 370 ft.

WEST TEXAS

Ector County: The Texas Co. 26 McDonald, 27-B16-PSL, 6 miles S Penwell. IP 523 BOPD, 14/64-in., TP 225 psi., GOR 228, 43.6°, Fusselman 7,505-25 ft. TD 7,532 ft., elevation 2,832 ft.

White Eagle Oil Co. and Freeport Sulphur Co. 1-32 Edwards Ranch, 32-43-T3S-T&P, 11 miles SW Odessa. IP 516 BOPD, 32/64-in., 47°, GOR 1720, Devonian pay top 11,989 ft. TD 13,454 ft., elevation 2,336 ft.

Kent County: General Crude Oil Co. 1 Fuller, 1-1-H&GN, 4 miles SW Girard. IP 30 BOPD, 18/64-in., TP 25 psi., GOR 921, 37°, Strawn reef 6,615-29 ft. TD 6,636 ft.

NORTH TEXAS

Clay County: L. T. Burns estate 1-C Brown, Mund Gross Sur., A-155, 5½ miles SE Blue Grove. IP 145 BO in 11 hours, 14/64-in., TP 600 psi., 44°, GOR 900, Mississippian 6,024-36 ft. TD 6,097 ft.

Jack County: L. T. Burns estate 2 Bowen, W. Wallace Sur., A-2029, 3½ miles SW Antelope. IPP 119 BOPD, 30/64-in., TP 260 psi., GOR 600, Strawn perforations 3,570-82 ft. TD 3,582 ft.

Knox County: I R T Drilling & Production Co. 1 Yost, 71-2-D&W, 3 miles NW Munday. IPP 84 BOPD, 34°, GOR 200, pay 2,009 ft. TD 2,014 ft.

Montague County: C. J. Brown 1 Flannery estate, G. J. Gordon Sur., A-309, 4 miles N St. Jo. IPP 113 BOPD, 38°, GOR 160, pay 3,906-16 ft. TD 4,163 ft.

Wise County: Socs Vratis 1 R. A. Pitts, W. A. Nicholson Sur., A-662, 1½ miles NW Chico. Recompleted as gas-distillate discovery. Perforated Atoka conglomerate 5,572-80, 5,597-5,600 ft., IP 4,200 M.c.f. gas, open flow, plus 32 bbl. distillate, 18/64-in., SIP 1,200 psi. TD 5,800 ft.

Young County: Fletcher Oil & Gas Drilling Corp. 1 Foster, Sec. 337, TE&L Sur., 10 miles NW Newcastle. IP 127 BOPD, 16/64-in., TP 130 psi., 41°, GOR 490, Mississippian 4,717-21 ft. TD 4,727 ft.

WEST CENTRAL TEXAS

Haskell County: Alvin C. Hope 1 Kay, Subd. 7, A. Slayden Sur. 58, 3 mi. E. Jud. IPP 100.6 BOPD, 41.5°, GOR 150, Jud sand 5,336-42 ft. TD 5,858 ft.

Parker County: Phillips Petroleum Co. 1-A Mittie, Sec. 179, T&P Sur., 1½ mi. SE Poolville. IP 4,617 M.c.f. gas, perforated 3,950-72 ft. TD 6,642 ft.

Shackelford County: Monsanto Chemical Co. 1 Oma, Sec. 46, BOA Sur., 2½ mi. N Moran. IP 188 BOPD, 14/64-in., TP 120 psi., 37.7°, GOR 610, Lake sand 3,805-11 ft. TD 4,250 ft.

Stephens County: Ambassador Oil Corp. 1-B West, 9-3-SPRR, 7 mi. N Caddo. IP 26,000 M.c.f. gas, pressures and chokes not reported. Pay 4,020 ft. TD 4,039 ft.

WEST TEXAS

Ector County: Cities Service Production Co. 1-B Parker, 20-44-T2S-T&P, 14 mi. W Odessa. IPP 79 BOPD, 39°, GOR 1137, Pennsylvanian pay 9,078 ft. TD 12,584 ft., PB 9,149 ft. Elev. 3,121 ft.

Pecos County: Standard Oil Co. of Texas 2 Claude Owens "2," 14-C4-GC&SF, 15 mi. W Sheffield. IPP 15 BOPD, 36°, pay 4,555 ft. TD 9,914 ft. Top Ellenburger 9,622 ft. elev. 2,694 ft.

Terry County: George P. Livermore 1 Covington estate, 5-D14-C&M Sur., 12 mi. N Tokio. IPP 65 BOPD, 31°, GOR 450, San Andres 5,031-35 ft. TD 5,070 ft.

NORTH TEXAS

Cooke County: Paul L. Miller 1 Mary E. Truitt estate, BBB&C Sur., A-140, 2½ mi. NW Woodbine. IPP 168 BOPD, 30°, GOR 200, pay 4,106 ft. TD 4,113 ft.

Grayson County: Nortex Oil & Gas Co. 1 Jewel, E. Gamahl Sur., A-1249, Section 34, 2 mi. SW Sandusky. IP 266 BOPD, ½-in., 26°, GOR 150, pay 6,519-48 ft. TD 6,568 ft.

Montague County: A. E. Boger 1 W. L. Davis estate, Blk. 19, Jack CSL, 12½ mi. NW Bowie. IP 168 BOPD, 24/26-in., TP 120 psi., 44°, GOR 400, conglomerate 6,240-50 ft. TD 6,298 ft.

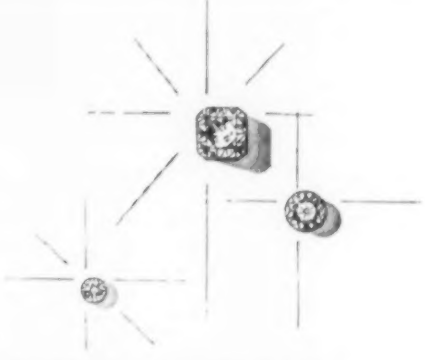
Wilbarger County: W. A. Moncrief Jr. 1 Marriott, Blk. 94, Waggoner Colony Subd., 6 mi. N Harrold. IP 252 BOPD, 40°, TP 180 psi., GOR 140, Strawn conglomerate 5,915-24 ft. TD 6,028 ft.

Wise County: K & H Operating Co., and Christie, Mitchell & Mitchell 1 Bailey, M. Swift Sur., A-739, 1 mi. NW Bridgeport. IP 50 BOPD, 12/64-in., 41.7°, GOR 550, TP 1410 psi., Caddo conglomerate 4,970-88 ft. TD 5,769 ft.

K & H Operating Co. et al 1 Conley, Hiram Tidwell Sur., A-808, 3 mi. SE Chico. IP 139 BOPD, 14/64-in., TP 580 psi., 41°, GOR 650, pay 3,930-4,010 ft. TD 5,900 ft.

Young County: Bright & Schiff 1 Furr, Sec. 339, TE&L Sur., A-586, 10 mi. NW Newcastle. IP 105 BOPD, 16/64-in., 35°, TP 300 psi., GOR 1500, Marble Falls 4,592-96 ft. TD 4,956 ft.

"Here, Kitty, Kitty, Kitty . . ."



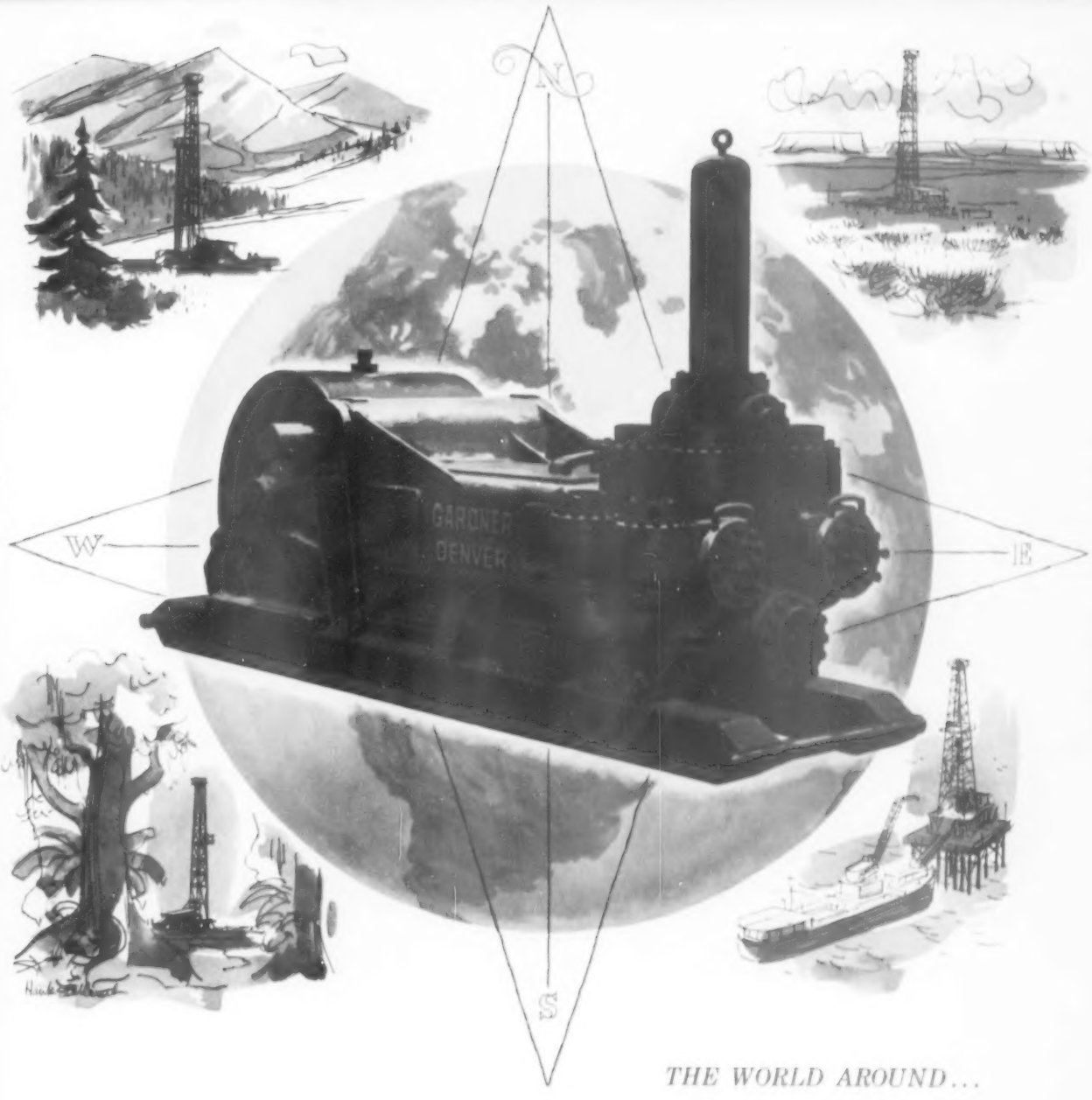
DIAMONDS ARE AN OIL MAN'S BEST FRIEND!

D&S TRUCO DIAMOND BITS make hole faster and save a tremendous amount of time and money. Ask us to have a D&S salesman-engineer advise regarding your particular diamond equipment needs.

Drilling & Service

DIAMOND DRILLING EQUIPMENT

DALLAS, TEXAS | OFFICES IN PRINCIPAL OIL AREAS



THE WORLD AROUND...

GARDNER-DENVER MUD PUMPS GIVE UNSURPASSED SERVICE

CONTINENTAL

Serving the Oil and Gas Industries

CONTINENTAL SUPPLY COMPANY

A Division of The Youngstown Sheet and Tube Company
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

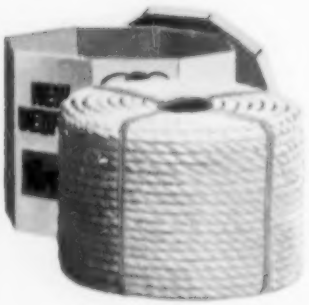
There are many sound reasons why Gardner-Denver Mud Pumps are universally accepted as the most consistently dependable in performance and economical in operation. Exclusive engineering design features assure maximum trouble-free performance . . . a minimum of maintenance.

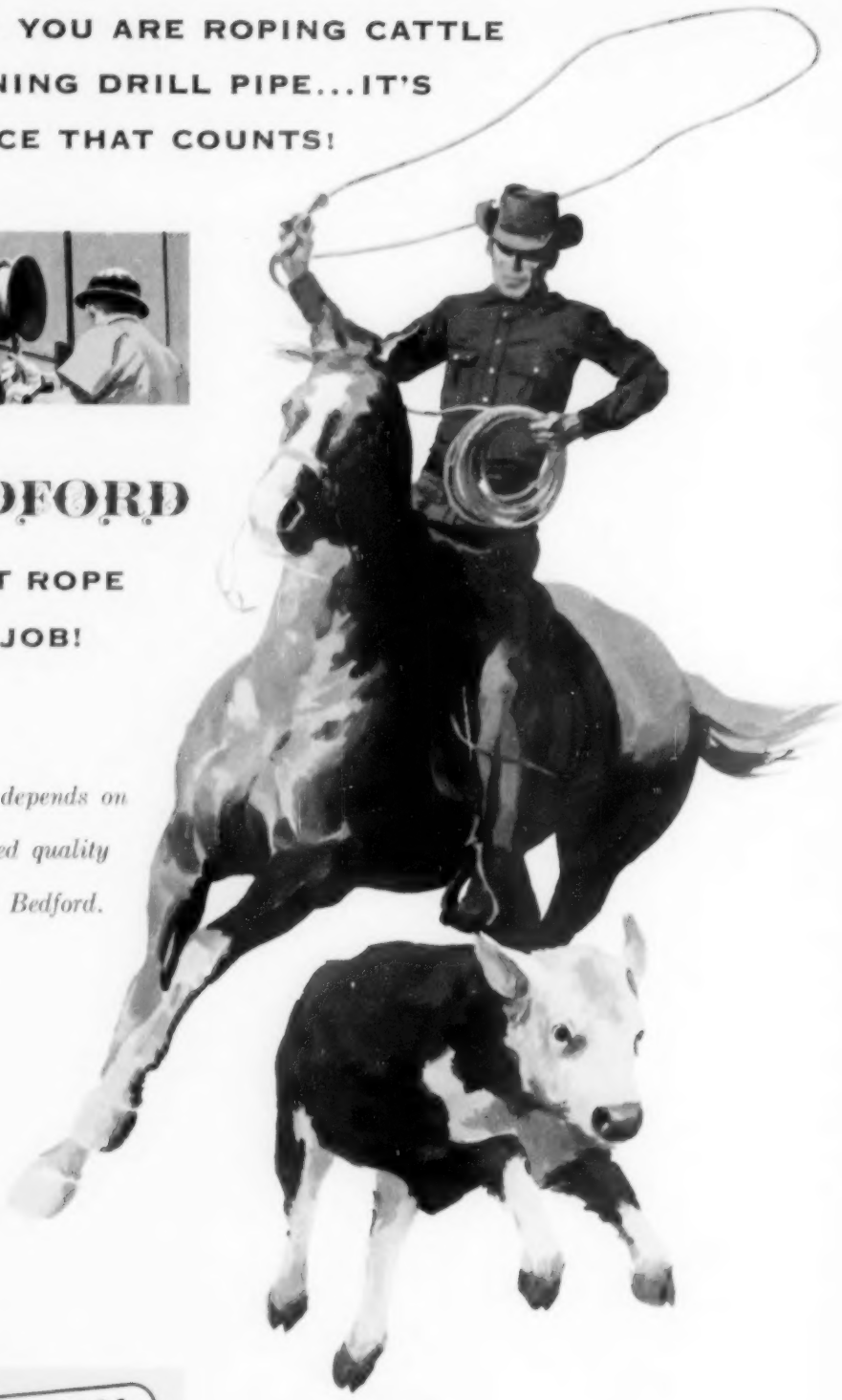
WHETHER YOU ARE ROPING CATTLE
OR SPINNING DRILL PIPE...IT'S
PERFORMANCE THAT COUNTS!

NEW BEDFORD

IS THE BEST ROPE
FOR THE JOB!

good performance depends on good quality... proved quality found only in New Bedford.





CONTINENTAL
Serving the Oil and Gas Industries

CONTINENTAL SUPPLY COMPANY
A Division of The Youngstown Sheet and Tube Company
General Offices: DALLAS, TEXAS
Representatives in All Principal Oil Fields of the World

MID-CONTINENT

OKLAHOMA

New Drilling Depth Record Set in Grady

Frankfort Oil Co. established a new drilling depth record for Oklahoma last week at its 1 Pruitt wildcat, west of Chickasha field in C NE NW 16-4n-8w, Grady County.

Frankfort went below 17,865 ft. in the Springer sand at the new record-breaker. Earlier, the well flowed gas from open hole at 17,300-82 ft. in the Springer at the rate of 6,900 M.c.f. per day.

The previous deep well in the state was a 17,823-ft. hole in Caddo County, Superior Oil Co. 58-11 Weller, NW NW NE 11-8n-12w. That well was dry and abandoned in 1948 at 17,823 ft.

Other deep wells . . . Frankfort is also busy making drilling history at other wells in southern Oklahoma.

The 1 Blackbear, SE NE NE 9-5n-10w, southwest of Cement field in Grady County, is drilling below 16,810 ft. The 1-A Freeman in NW NE SE 1-1s-1w, 2 miles west of Southeast Hoover field in Murray County, is below 14,512 ft. The 1 Sparks in C SE SE 32-1s-1w, Murray County, 6 miles east of Sho-Vel-Tum district, is below 12,534 ft.

If Frankfort completes the Pruitt well in the deep Springer pay sand it would establish a new producing-depth record for the state.

LEGAL

NOTICE OF SALE NO. 7 OF OIL AND GAS MINING LEASE RESTRICTED INDIAN LAND

DEPARTMENT OF THE INTERIOR BUREAU OF INDIAN AFFAIRS CROW INDIAN AGENCY CROW AGENCY, MONTANA

SEALED BIDS will be received until 2:00 P.M. Mountain Standard Time, **August 29, 1956**, and opened at that time in the office of the Superintendent of the Crow Indian Agency, Crow Agency, Montana, for the leasing of Units of restricted Indian Lands comprising **28,380.97** acres of land where the mineral rights are reserved for the benefit of the Crow Tribe by the Act of June 4, 1920, (41 Stat. 751-753), lands described on the attached sheets, located in Treasure and Big Horn County, Montana for oil and gas mining purposes. The sale will be conducted under regulations of the Secretary of the Interior, Title 25, CFR 196 (Act of June 4, 1920, 41 Stat. 751-753). Each unit to be bid on separately. The right is reserved to reject any and all bids and to disapprove any lease submitted on an accepted bid. The units of land are being offered subject to the approval of the Crow Tribal Council, and a separate lease will be drawn on the applicable forms for each unit. Should any bid be rejected or lease disapproved through no fault of the bidder, all deposits shall be returned to the bidder. The lease on lands to which minerals are reserved for the benefit of the Crow Tribe, Act of June 4, 1920 (41 Stat. 751-753) will be for a period of 10 years, from date of approval by the Secretary of the Interior or his authorized representative, with the right of renewal for an additional period to and including June 3, 1970, upon such terms and conditions as the Secretary of the Interior may prescribe and by showing to the satisfaction of the Secretary of the Interior that the leased premises are then producing oil or gas in paying quantities, provided, that any extension of any renewal lease beyond June 3, 1970, shall not be effective unless before that date such extension shall have been ratified by the Congress. Subject to the foregoing, leases will be sold to the bidder who offers the highest money bonus upon a per acre basis. Conditional or alternate bids will not be considered. No drilling propositions will be considered as a part of the bonus offer. **Each bid must be accompanied by a deposit in an amount not less than 25 per cent of the bonus bid.** All deposits are to be made by certified check or bank draft on a solvent bank, made payable to the **Bureau of Indian Affairs. Sight drafts will not be accepted.** The successful bidder or bidders will be required to pay their proportionate share of the advertising costs. Deposits from unsuccessful bidders will be returned. In the event two or more bids are in the same amount and such bids are the high bids, the bidders submitting such bids may be required to draw lots to determine the successful bidder. **IMPORTANT NOTICE:** All successful bidders will be required to prepare their own leases. Leases will be drawn on approved forms (special form is required for leases on land where minerals are reserved for the benefit of the Crow Tribe). Forms may be obtained from the office of the Superintendent, Crow Indian Agency, Crow Agency, Montana. Within 30 days after notification of being the successful bidder, said bidder must remit the balance of the bonus, the first year's rental, and his share of the advertising costs, together with a filing fee of $5.00 for each lease, and shall file with the superintendent the lease in completed form. The Superintendent may, for good and sufficient reasons extend the time for the completion and submission of the lease form, but no extension shall be granted for remitting the balance of monies due. If the successful bidder fails to pay the full consideration within said period, or fails to file the completed lease within the said period or extension thereof, or if the lease is disapproved through no fault of the lessor or the Department of the Interior, 25 per cent of the bonus bid will be forfeited for the use and benefit of the Indian lessor. **BONDS:** (a) Lessee shall furnish with each lease a bond (Form 5-154b), with an acceptable company authorized to act as sole surety, or with two or more personal sureties and a deposit as collateral security of any public-debt obligations of the United States guaranteed as to principal and interest by the United States, equal to the full amount of such bonds, or other collateral satisfactory to the Secretary of the Interior, or show ownership of unencumbered real estate of the value equal to twice the amount of the bonds. Lessee may file a bond on Form 5-154a without sureties and a deposit as collateral security of Government bonds equal in value to the full amount of the bond. Lease bonds shall be in the following amounts: For less than 80 acres, $1,000; For 80 acres and less than 120 acres, $1,500; For 120 acres and not more than 160 acres, $2,000; For each additional 40 acres, or part thereof above 160 acres, $500. PROVIDED, That a lessee may file one bond (Form 5-154f), in the sum of $15,000 for all leases of minerals in any one State and which may also include leases on that part of an Indian reservation extending into States contiguous thereto, to which the lessee may become a party: PROVIDED FURTHER, That the total acreage covered by the bond shall not exceed 10,240 acres. (b) In lieu of the bonds required under paragraph (a) of this section, a lessee may furnish a bond (Form 5-156) in the sum of $75,000 for full nationwide coverage with an acceptable company authorized to act as sole surety to cover all oil and gas leases and oil and gas prospecting permits without geographic or acreage limitation to which the lessee or permittee is or may become a party. (c) The right is specifically reserved to increase the amount of bonds and the collateral security prescribed in paragraph (a) of this section in any particular case when the officer in charge deems it proper to do so. The nationwide bond may be increased at any time in the discretion of the Secretary of the Interior. The rate of royalty will be 12½ per cent on all leases. The rental of $1.25 per-acre paid for any one year will be credited on the royalty for that year. A charge of $1.00 will be made for each set of lease forms. The adequacy of the bonus offer will be considered by the United States Geological Survey. The responsibility of complying with any requirement of the Federal Documentary stamp statutes will be left with the successful lessee. In addition to all other remedies provided by law, failure of the successful bidder to comply with terms of the sale will render all deposits theretofore made by or due from him subject to forfeiture without further action on the part of this office. **Method of future payment of rental and/or royalty:** Payment on all approved Indian Oil and Gas Leases on lands located under the jurisdiction of this Agency should be made payable, when due, to the **Bureau of Indian Affairs** and transmitted to the Superintendent of the Crow Indian Agency, Crow Agency, Montana, THROUGH the Regional Oil and Gas Supervisor, U. S. Geological Survey, P. O. Box 400, Casper, Wyoming. All bids should be addressed to the Superintendent, Crow Indian Agency, Crow Agency, Montana, in a plain envelope marked "Bid for Oil and Gas Mining Lease, not to be opened until 2:00 P.M. Mountain Standard Time, **August 29, 1956.** Address all inquiries to: Superintendent Crow Indian Agency, Crow Agency, Montana.

L. C. Lippert
Superintendent.

DATED: July 25, 1956.

MINERAL RIGHTS RESERVED FOR THE BENEFIT OF THE CROW TRIBE BY ACT OF JUNE 4, 1920 (41 Stat. 751-753)

Unit No.	Description	Section	Acreage
	Township 4 North, Range 35 East, P.M.M.		
No. 1	Lots 1,2,3,5,6,7,8,9,10,11,12,	3	451.47
No. 2	Lots 2,3,6,7,8,9,10,11,12, $N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	4	
	$NE\frac{1}{4}SE\frac{1}{4}$	5	
	$N\frac{1}{2}NW\frac{1}{4}$,	9	729.68
No. 3	$SW\frac{1}{4}SW\frac{1}{4}$,	8	40.00
No. 4	$N\frac{1}{2}$, $SE\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SW\frac{1}{4}SW\frac{1}{4}$,	11	600.00
No. 5	$S\frac{1}{2}NE\frac{1}{4}$,	13	80.00
No. 6	$NW\frac{1}{4}NW\frac{1}{4}$, $N\frac{1}{2}N\frac{1}{2}$, $SW\frac{1}{4}NW\frac{1}{4}$,	13	
	$NW\frac{1}{4}SW\frac{1}{4}$, $N\frac{1}{2}SE\frac{1}{4}$, $SE\frac{1}{4}SE\frac{1}{4}$,	14	
	$NE\frac{1}{4}SW\frac{1}{4}$,	15	440.00
No. 7	$S\frac{1}{2}$, $NW\frac{1}{4}$, $SE\frac{1}{4}NE\frac{1}{4}$,	25	520.00
No. 8	$N\frac{1}{2}$, $SE\frac{1}{4}$, $N\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}SW\frac{1}{4}$,	26	
	$E\frac{1}{2}E\frac{1}{2}$, $SW\frac{1}{4}SE\frac{1}{4}$,	27	800.00
No. 9	$SE\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$, $NW\frac{1}{4}SE\frac{1}{4}$,	29	120.00
	Township 5 North, Range 35 East, P.M.M.		
No. 10	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$	5	640.24
No. 11	Lots 1,2,3,4,5,6,7, $S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	6	633.98
No. 12	Lots 1,2, $E\frac{1}{2}NW\frac{1}{4}$, $E\frac{1}{2}$,	7	477.04
No. 13	All	8	640.00
No. 14	$NW\frac{1}{4}$, All	13 14	800.00
No. 15	All	17	640.00
No. 16	Lots 2,3,4, $SE\frac{1}{4}NW\frac{1}{4}$, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	18	396.23
No. 17	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	19	635.60
No. 18	$S\frac{1}{2}$, $NW\frac{1}{4}$, $S\frac{1}{2}NE\frac{1}{4}$,	20	560.00
No. 19	$N\frac{1}{2}$, $W\frac{1}{2}SW\frac{1}{4}$,	21	400.00
No. 20	$W\frac{1}{2}W\frac{1}{2}$,	24	160.00
	Township 5 North, Range 35 East, P.M.M.		
No. 21	$E\frac{1}{2}SE\frac{1}{4}$,	24	80.00
No. 22	$S\frac{1}{2}$,	26	320.00
No. 23	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $N\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NE\frac{1}{4}$, $S\frac{1}{2}SE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$,	31	558.71
No. 24	$W\frac{1}{2}$, $S\frac{1}{2}SE\frac{1}{4}$,	32	400.00
No. 25	All	33	640.00
No. 26	All	34	640.00
No. 27	$S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	35	480.00
	Township 4 North, Range 36 East, P.M.M.		
No. 28	Lots 1,2,3,4,5,6,7,8,9,10,11, 12, $S\frac{1}{2}$,	1	886.84
No. 29	Lots 1,2,3,4,5,6,7,8,9,10,11, 12, $S\frac{1}{2}$,	2	806.64
No. 30	Lots 1,2,3,4,5,6,7,8, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	3	806.20
No. 31	Lots 1,3,4,5,6,8, $SE\frac{1}{4}$, $S\frac{1}{2}SW\frac{1}{4}$, $NW\frac{1}{4}SW\frac{1}{4}$,	4	525.21
No. 32	$S\frac{1}{2}N\frac{1}{2}$, $SW\frac{1}{4}$, $W\frac{1}{2}SE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$,	5	440.00
No. 33	All	11	640.00
No. 34	$E\frac{1}{2}$, $SW\frac{1}{4}$,	13	480.00
No. 35	All	14	640.00
No. 36	$S\frac{1}{2}NE\frac{1}{4}$, $SE\frac{1}{4}NW\frac{1}{4}$, Lots 3,4, $E\frac{1}{2}SW\frac{1}{4}$, $SE\frac{1}{4}$,	18	435.03
No. 37	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	19	631.60
No. 38	All	20	640.00
No. 39	All	21	640.00
No. 40	$N\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}NW\frac{1}{4}$,	23	240.00
No. 41	All	24	640.00
No. 42	All	27	640.00
No. 43	$SW\frac{1}{4}SW\frac{1}{4}$, All	28 29	680.00
No. 44	Lots 1,2,3,4, $E\frac{1}{2}W\frac{1}{2}$, $E\frac{1}{2}$,	30	633.04
No. 45	Lots 1,2,3, $E\frac{1}{2}NW\frac{1}{4}$, $NE\frac{1}{4}SW\frac{1}{4}$, $NE\frac{1}{4}$,	31	394.75
	Township 5 North, Range 36 East, P.M.M.		
No. 46	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$,	3	319.36
No. 47	Lots 1,2,3,4, $S\frac{1}{2}N\frac{1}{2}$, $S\frac{1}{2}$,	4	639.40
No. 48	$W\frac{1}{2}$, $W\frac{1}{2}SE\frac{1}{4}$,	20	400.00
No. 49	$E\frac{1}{2}$, $SW\frac{1}{4}$, $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}NW\frac{1}{4}$, $S\frac{1}{2}NW\frac{1}{4}NW\frac{1}{4}$, $NE\frac{1}{4}NW\frac{1}{4}NW\frac{1}{4}$	22	630.00
No. 50	All	23	640.00
No. 51	$NW\frac{1}{4}SW\frac{1}{4}$, $S\frac{1}{2}S\frac{1}{2}$,	27	200.00
No. 52	$SW\frac{1}{4}NE\frac{1}{4}$, $NW\frac{1}{4}$, $NE\frac{1}{4}$, $NE\frac{1}{4}SE\frac{1}{4}$,	28 29	400.00
No. 53	$E\frac{1}{2}$, $SW\frac{1}{4}$, $E\frac{1}{2}NW\frac{1}{4}$, $SW\frac{1}{4}NW\frac{1}{4}$,	33	600.00
No. 54	All	34	640.00
	Township 7 South, Range 33 East, P.M.M.		
No. 55	$S\frac{1}{2}$,	29	320.00

Take it from Atlantic's expert . . .

. . . Last Big Oil Play Offshore

ATLANTIC REFINING CO., on its own and as a member of the big C.A.T.C. group, has from the start been one of the country's most active offshore oil operators.

It's a good bet to maintain that activity with its new chief geologist, Robert N. Kolm. Kolm at 57 is an Atlantic veteran, now in his thirty-seventh year with the company's geological department.

Like a good many others in this profession, he thinks that the tidelands in the Gulf of Mexico make up the nation's last great domestic oil reserve.

This doesn't mean that there aren't large oil fields still undiscovered inland, Kolm emphasizes, but these are becoming increasingly hard to find. Prominent structures, such as are now being drilled in the gulf, are all but gone inland.

Kolm feels that it is reasonable to expect that new pools will be as thickly concentrated under the gulf waters as they are along the prolific Texas-Louisiana coastal belt. Some of them will be small and may not pay out the heavy cost of finding and developing them, but many really big fields will be found too.

The first important offshore wildcat to be spudded in by Atlantic since Kolm began his tenure as chief geologist will get under way soon roughly 20 miles off Port Aransas, Tex. It is a joint venture with Gulf Oil Corp. and Tidewater Oil Co.

It will test a large structure under 83 ft. of water. A previous venture, drilled late last year, was dry. The test will be drilled by Glasscock Drilling Co.'s "Mr. Gus."

Lives geology . . . Kolm is absorbed in his work—to the extent that he usually spends at least 6 days a week at it.

Petroleum geology is his only consuming interest.

He was born in Schuyler, Neb., and attended grade and high schools in Kansas and Oklahoma. He studied geology at University of Oklahoma, working between terms in the summer as a field assistant for Empire Gas & Fuel Co. (Cities Service Oil Co.).

Kolm joined Atlantic in the fall of 1919 and has been there even since.

As an Atlantic geologist, Kolm was engaged in surface geological mapping in Oklahoma, Kansas, Texas, Kentucky, and Cuba through the twenties and early thirties. During this time, he saw Texas develop as a great producing region and worked through many of its spectacular booms including those at Ranger, Conroe, and Burkburnett.

He opened Atlantic's Southwest Texas geological office at San Antonio in 1936 and became district geologist there in 1942. He was transferred to Dallas in January 1951, and held the position of assistant chief geologist until his present promotion.

Philip A. Kahle, Jr., manager of refining for Frontier Refining Co., Cheyenne, Wyo., has been elected a vice president of the company. Kahle, a former vice president of Refinery Engineering Co., Tulsa, joined Frontier early in June.

Personals

Hulen Stanfield, production foreman for Pan American Production Co. in Big Spring, Tex., has joined Fred W. Shield Oil Co. in Midland.

T. W. (Tommy) Ward has resigned as vice president of Schafer Drilling Co. to form the Tommy Ward Drilling Co. in Oklahoma City.

Ammon V. Caffey, pipeline foreman with Cities Service Pipe Line Co. at Guymon, Okla., has been appointed superintendent of the company's new field office at Medicine Lodge, Kans.

Adm. Ben Moreel, chairman of Jones & Laughlin Steel Corp., will receive the John Fritz Medal October 17 at the annual meeting of the American Society of Civil Engineers in Pittsburgh. The award is sponsored jointly by the A.I.M.E., the A.S.M.E., the A.I.E.E., and the A.S.C.E. The medal is awarded annually for notable industrial or scientific achievement.

William Jack Anderson has left his job as process superintendent with Commonwealth Oil Refining Co. in Ponce, Puerto Rico, to become head engineer in the project engineering division at the Whiting, Ind., refinery of Standard Oil Co. (Ind.).

M. H. MITCHELL

Martin H. Mitchell, manager of Tidewater Oil Co.'s western division land department, has been appointed manager of the company's operations in Turkey. He succeeds **Jay T. Gist,** who has been transferred to Beirut, Lebanon. A graduate of the University of California, Mitchell joined Tidewater in 1937.

Newell B. Hunnicutt has been appointed vice president of International Brown Drilling Corp. His headquarters will be in Maracaibo, Venezuela. Hunnicutt has been with the Brown company for 10 years, recently serving as operations manager.

Norman C. Knapp has been appointed district geologist at Bismarck, N. D., by Mobil Producing Co. **Jerry Cookson,** formerly with a geophysical crew at Belle Fourche, S. D., has been named geophysical engineer at Bismarck. Cookson succeeds **Eugene Lee,** who has been transferred to Roundup, Mont.

Frank E. Lewis, chief geologist with Southern California Petroleum Co., has been transferred from Denver to Los Angeles.

M. O. Atkins, tool pusher for Penrod Drilling Co. in Raceland, La., has been transferred to Port Sulphur, La.

R. F. BENNETT

Roy F. Bennett, chief geophysicist of Sohio Petroleum Co., Oklahoma City, has been elected president of the Society of Exploration Geophysicists. He succeeds **R. C. Dunlap, Jr.,** of Geophysical Service, Inc., Dallas. Other officers are **Dr. J. P. Woods,** vice president, director of the Dallas geophysical research laboratory of Atlantic Refining Co.; **John C. Hollister,** secretary-treasurer, Colorado School of Mines. **Dr. Norman Ricker,** Carter Oil Co., Tulsa, will complete his 2-year term as editor this year. Officers will be installed during the society's October 29 meeting in New Orleans.

Gerald and **Melvyn Abels,** operators of the Gama Oil Co. at El Dorado, Kans., have formed the Abels Pipe & Supply Co. in Wichita.

R. B. Stobaugh, chemical engineer, has been transferred to the engineering department of Caltex Services, Ltd., London, from Bahrain Petroleum Co., Bahrain refinery, Persian Gulf.

H. R. Minor, field superintendent with United Carbon Co., has been transferred from Woodsboro, Tex., to Rockport, Tex.

Robert Gardner has been named by Christie, Mitchell & Mitchell, Houston independent oil firm, to direct exploration activities at a newly opened office at Dallas.

Richard A. Flohr and **Robert L. Jewett,** exploration engineers in Shell Oil Co.'s area office in Los Angeles have been transferred. Flohr will be in Ventura and Jewett in Long Beach.

Andrew C. Boush, Ray H. Greutert, Martin W. McGarry, and **Eugene B. Muehlberger,** junior exploration engineers in Shell Oil Co.'s Los Angeles area office, have been promoted to exploration engineers. McGarry will remain in Los Angeles. Greutert and Muehlberger have been transferred to Ventura, and Boush has been transferred to Bakersfield.

Elwin M. Pedcock, district geologist at Midland with Sohio Petroleum Co., has been transferred to Oklahoma City.

Jules D. Baribault, mechanical engineer with Shell Oil Co., has been transferred from Franklin, La., to the marine production division at New Orleans.

L. W. Zimmerman, district superintendent with Mid-Continent Pipe Line Co. in Lindsay, Okla., has been transferred to Hominy, Okla.

R. Kenneth Smith, formerly with Kansas Corporation Commission's oil and gas division, has been appointed Kansas regional geologist by the Natural Gas & Oil Corp.

Richard W. Thompson, production superintendent with Creslenn Oil Co. in Abilene, Tex., has been promoted to chief engineer in the company's Dallas office.

William W. Ridenour, process-products plant foreman, has been named superintendent of lubricants and process products at the Vernon Process Laboratory of General Petroleum Corp., Los Angeles. **D. G. Baldwin** has been named lubricants coordinator.

John L. Bible has been named vice president in charge of gravity, magnetic and radiometric operations in Southern Geophysical Co.'s Houston office. Before joining Southern, Bible was chief of gravity and magnetic research for Stanolind Oil & Gas Co. and later president of Tidelands Exploration Co.

F. A. Upson has been named chief engineer in the general engineering department of the Whiting, Ind., refinery of Standard Oil Co. (Ind.). He succeeds **Harold M. Romig** who has retired. **Otis J. Thompson** succeeds Upson as assistant chief engineer in the process engineering division. **Wilbert J. Buxton** replaces Thompson as head engineer in charge of the lube-oil and asphalt section.

B. R. Dorsey has been appointed coordinator in Gulf Oil Corp.'s manufacturing department, Pittsburgh. He succeeds the late E. J. Kirberg. Dorsey was formerly supervisor of scheduling and cost control, manufacturing department. He has been with Gulf since 1940. He was at one time technical foreman of the laboratory and technical service division at Gulf's Port Arthur refinery, and later served at Puerta la Cruz as manager of Venezuelan Gulf Refining Co.

Personals

C. A. Fowlkes, seismologist for Shell Oil Co., Sayre, Okla., has been transferred to Oklahoma City.

Leon H. Terrell has been named administrative assistant in Creole Petroleum Corp.'s refining department. He replaces **R. K. Meeker,** who has resigned.

Donald William Rolfs, production foreman for Continental Oil, has been transferred from Davis, Okla., to Oklahoma City.

J. T. Crooker, assistant chief engineer for producing at the San Francisco office of Standard Oil Co. of California, has been appointed district superintendent of the company's Red Wash field in Utah and transferred to Vernal, Utah.

B. H. Corey, formerly production manager for General Petroleums of Canada, Ltd., has been appointed general manager of Sunshine Exploration, Ltd., a subsidiary of Sunshine Mining Co., Spokane, Wash. Corey will be based in Calgary.

J. L. Irwin has been appointed general manager of domestic pipeline department by Gulf Oil Corp, and **Walter**

W. L. SHANNON

J. L. IRWIN

L. Shannon has been named manager of domestic pipeline operations. Irwin has been with Gulf since 1917; Shannon since 1920.

R. C. Turner has been appointed manager of crude supply by British American Oil Co., Ltd., Toronto. Turner has been manager of the company's crude oil purchasing department and pipelines at Calgary since 1951. In other appointments, **J. F. O'Neil,** manager of Canadian Gulf Oil Co.'s crude-oil purchasing department in Calgary, has been named western division manager of crude supply, and **R. H. Clendining,** assistant manager of Canadian Gulf's oil purchasing department, has been made assistant manager of the western division crude supply.

Personals

O. R. Young, tool pusher with Survey Drilling Co., has been transferred from Flomaton, Ala., to Dallas.

Jack A. Falkenberg has been named vice president of the Oceanic Oil Co. in Los Angeles.

John A. Weideman, production engineer with Continental Oil Co. at Roswell, N. M., has been transferred to Hobbs, N. M.

William Parker White, chemical engineer with Humble Oil & Refining Co., has been transferred from Tyler, Tex., to New Orleans.

Roy E. Campbell, formerly group leader in the engineering department of Stanolind Oil & Gas Co.'s Midland production office, has resigned to join the firm of Leibrock & Landreth, Midland, as a partner. The firm has been renamed Leibrock, Landreth & Campbell.

Vaughn M. Hubert has been transferred from Houston to Abilene, Tex., by Humble Oil & Refining Co. as district geologist of the company's recently opened district office at Abilene. **Gene Peeples** and **J. J. Purzer** have been transferred from Wichita Falls to Abilene as staff geologists.

C. H. Calvert has been appointed production manager of Commonwealth Oil Co. of Houston. A petroleum engineering graduate of the University of Texas, Calvert formerly was assistant division superintendent in the Houston office of D. D. Feldman Oil & Gas Co. He will direct the company's drilling and production activities in the Gulf Coast, South Texas and South Louisiana areas.

William B. Macke, district geologist for Lion Oil Co. at Bismarck, N. D., has joined the Kentucky Geological Oil Survey as principal assistant. He replaces **Robert J. Floyd,** who resigned to become assistant to state geologist **D. J. Jones** in the Tennessee division of geology at Nashville. **William D. Rose,** formerly geologist with Gulf Oil Corp. at Midland, has joined the Kentucky Survey as branch geologist at Henderson, Ky. He succeeds **Joseph B. Cathey,** now with Ashland Oil & Refining Co. in Henderson.

C. H. Duncan has been appointed manager of Creole Petroleum Corp.'s petroleum economics department. He succeeds **O. B. Knight,** who has retired.

John H. Atwood, petroleum and drilling engineer with Sohio Petroleum Co. in Pauls Valley, Okla., has joined Warren-Bradshaw Exploration Co. in Tulsa as drilling engineer. Atwood is a member of the American Petroleum Institute, serving as vice chairman of its straight hole drilling committee and as a member of the drilling fluids committee.

J. R. McWilliams has been made vice president of Royal Oil & Gas Co. of Tulsa, formerly Laurel Oil & Gas Co.

Chester Burton, Jr., geologist with El Paso Natural Gas Co., has been transferred from Farmington, Tex., to Midland.

Clyde Nath, Kerr-McGee Oil Industries, Inc., geologist, has been transferred from Oklahoma City to Billings, Mont.

J. Earle Gray has been appointed assistant general manager of Tidewater Oil Co.'s western division, San Francisco. He replaces **Charles R. Brown** who has been transferred to Tulsa as general manager of Tidewater's Mid-Continent activities.

A. P. McConnell, Jr., has been promoted by The Texas Co. from staff geologist at Midland, Tex., to district geologist at Farmington, N. M. The Farmington district consists of the Four Corners area of New Mexico, Arizona, Utah, and Colorado.

J. W. Mason, area geologist in Stanolind Oil & Gas Co.'s Midland office, has been promoted to district geologist and transferred to Wichita.

George A. Gilbert has joined Parker Petroleum Co., Ponca City, as assistant to the president. Gilbert has been with Tidewater Oil Co. for the past 5 years.

Charles Taylor, special representative in the asphalt department of Pan-Am Southern Corp., will become acting manager of the department September 15. Taylor replaces **John D. Mohler,** who has resigned.

Jack W. Williamson, former production engineer for Continental Oil Co. at Fort Worth and production engineer and assistant production superintendent for Woodson Oil Co., has joined H. J. Gruy & Associates, consulting engineering firm at Dallas.

J. W. GENDRON

John W. Gendron, manager of Tidewater Oil Co.'s oil purchase and exchange department, has been elected president of Iricon Agency, Ltd. The agency represents nine United States oil companies holding 5 per cent interest in Iranian consortium. Gendron succeeds **R. S. Stewart,** vice president of Standard Oil Co. (Ohio). Other Iricon officers are **L. C. Bergquist,** vice president, Iricon London office; **J. J. Shrewsbury,** treasurer, Hancock Oil Co.; **S. K. McCauley,** assistant treasurer, Atlantic Refining Co.; **Raymond W. Ickes,** assistant secretary, American Independent Oil Co. **Benjamin Tyran,** American Independent, and **John K. Schemmer,** San Jacinto Petroleum Co., were elected directors.

DEATHS

Ralph H. Espach, 56, chief of the U. S. Bureau of Mines petroleum branch, Region III, died August 6 in Laramie, Wyo. Well known for his numerous publications on oil production in the Rocky Mountain area, Espach had been with the Bureau of Mines since 1926.

Harry Basher, 68, independent oil producer, died August 2 in Bakersfield, Calif. Basher had been active in the Bakersfield area since 1909.

Aaron S. Cochran, 78, pioneer Michigan drilling contractor and oil producer, died August 3 in Holland, Mich.

Jack Martin Coady, 46, administrative assistant to the president of Macmillan Petroleum Corp., died August 4 in Los Angeles.

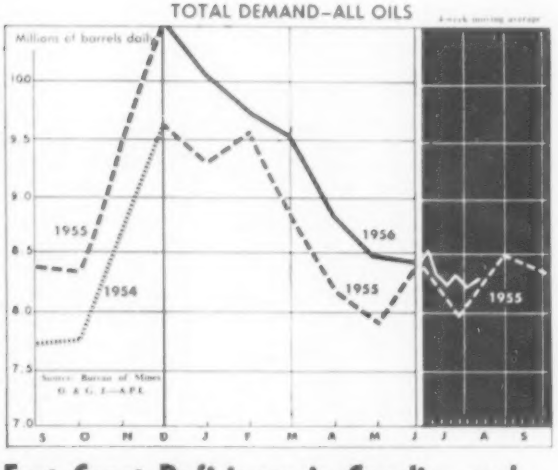
H. F. (Fred) Owen, 68, pioneer California oil man, died August 3 in Santa Barbara, Calif. Owen was general manager of the Berry Oil Co. and a director of the San Joaquin Independent Oil Producers Association.

Elbert Howard Catlin, 83, Houston, retired chief engineer for The Texas Co., died August 13 in Thomaston, Conn., where he was visiting relatives. Catlin retired in 1939.

Latest Figures . . . Industry Trends

A QUICK LOOK AT THE HIGHLIGHTS

	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	7,086,525	DOWN	4,625	UP	447,325
Crude stocks	279,043,000	UP	2,003,000	UP	13,417,000
Completions	1,208	DOWN	26	UP	141
Refinery runs	8,049,000	UP	85,000	UP	379,000
Gasoline stocks	177,557,000	DOWN	4,000	UP	22,574,000
Kerosine stocks	29,632,000	UP	217,000	DOWN	3,179,000
Distillate stocks	124,173,000	UP	4,884,000	UP	1,959,000
Residual stocks	45,541,000	UP	943,000	DOWN	164,000
Four-product stocks	376,903,000	UP	6,040,000	UP	21,190,000
Total imports	1,212,900	DOWN	212,700	UP	110,900



East Coast Deficiency in Gasoline and Distillate Up Six Tanker Loads Per Day

POSTWAR figures show that demand for petroleum products on the East Coast has been growing much faster than refinery production of these products within the district.

Total sales of all distillate fuels in PAD District 1 averaged 317,300 bbl. daily for the year 1946. By 1955 the daily rate had climbed to 779,600 bbl. daily for a net gain of 145.7 per cent. (District 1 includes all of the East Coast states plus West Virginia.)

Production of distillate fuels at refineries in District 1 averaged 161,900 bbl. daily in 1946 and had gained 80.5 per cent to 292,400 bbl. daily for 1955.

Distillate sales in District 1 exceeded refinery production of these products by 155,000 bbl. daily in 1946. This deficiency represented about five T-2 tanker loads every 4 days. For 1955, distillate sales topped production in District 1 by 487,000 bbl. daily or about four T-2 tanker loads per day.

This gain in the amount of distillate that had to be moved into District 1 amounted to 332,000 bbl. daily or 214 per cent. Movement of distillate into District 1 in 1955 represented almost three more T-2 tanker loads per day than in 1946.

The volumetric gain in the amount of gasoline that was shipped into District 1 to meet demand was about equal to the increased movement of distillate fuels but the percentage increase was less.

Gasoline sales in District 1 amounted to 630,000 bbl. daily in 1946 and had moved up to 1,172,000 bbl. daily by 1955 for a gain of 542,000 bbl. daily or 86.0 per cent.

For the same period, refinery production of gasoline increased from 303,700 bbl. daily to 476,600 bbl. daily, a net gain of 182,000 bbl. daily or 60.2 per cent.

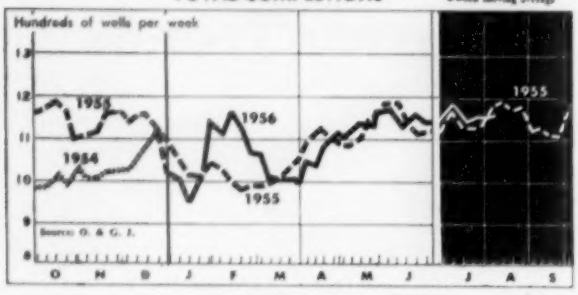
For the 9-year period, required movement of gasoline into District 1 gained 369,000 bbl. daily, about three T-2 tanker loads.

Receipts of gasoline and distillate will be cut about one tanker load per day when the two new East Coast refineries are completed early next year.

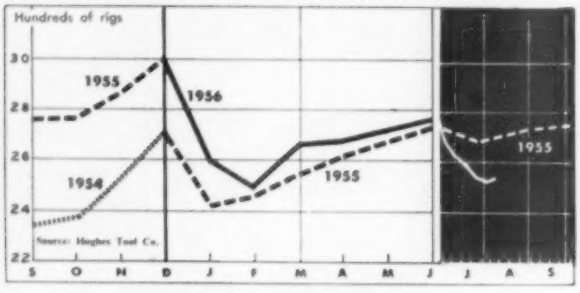
SALES AND PRODUCTION—PAD DISTRICT 1
(Thousands of barrels)

	Sales	Refinery production	Excess of sales over production: Thou. bbl.	Excess of sales over production: Thou. bbl. dly.
		DISTILLATE		
1946	115,800	59,103	56,697	155
1947	146,374	61,463	84,911	233
1948	166,186	72,211	93,975	257
1949	159,761	63,577	96,184	264
1950	191,553	78,281	113,272	310
1951	217,536	95,806	121,730	334
1952	229,074	95,913	133,161	364
1953	232,876	98,942	133,934	367
1954	258,217	101,479	156,738	429
1955	284,546	106,687	177,859	487
		GASOLINE		
1946	229,986	110,868	119,118	326
1947	252,351	119,492	132,859	364
1948	273,102	127,358	145,744	398
1949	292,272	130,945	161,327	442
1950	319,617	150,777	168,840	463
1951	341,646	160,492	181,154	496
1952	362,955	167,412	195,543	534
1953	382,319	171,369	210,950	578
1954	397,344	171,714	225,630	618
1955	427,796	173,975	253,821	695

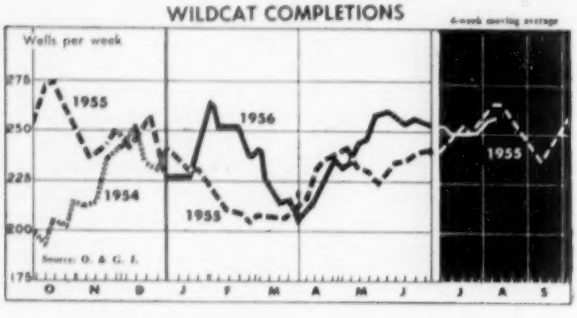
TOTAL COMPLETIONS



ROTARY RIGS OPERATING IN UNITED STATES



WILDCAT COMPLETIONS



ACTIVE ROTARY RIGS*

Area—	8-13-56	8-6-56	8-15-55
North Central and East	125	133	144
Southeast	40	39	29
Okla., Kans., Ark., Mo.	450	420	527
Louisiana	467	450	403
North and East Texas—Panhandle	356	371	381
Gulf and South Texas	227	252	248
West Texas-New Mexico	490	487	524
Rocky Mountain	262	259	338
Pacific Coast	108	109	141
Total United States	2,525	2,520	2,735
Western Canada	241	238	217

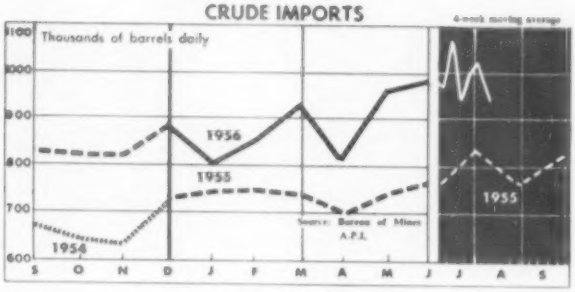
*Hughes Tool Co.

WEEKLY WELL COMPLETIONS . . . WEEK ENDED AUGUST 11, 1956

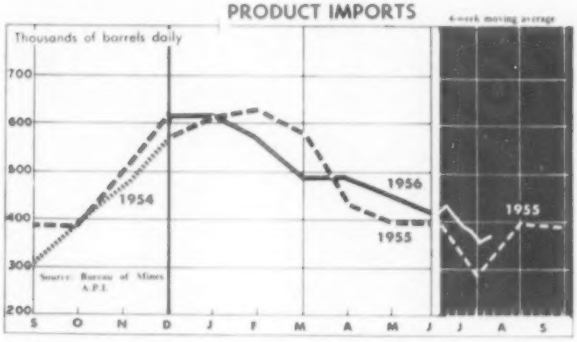
	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1956				
	Comp.	Oil	Gas	Dry	Footage	1956	1955	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
Ala.-Ga.-Fla.	2	2	0	0	22,897	66	49	0	0	0	0	0	0	0	1	29	30
Arkansas	22	15	0	7	57,453	511	469	2	0	0	2	4	26	0	3	84	113
California	45	32	2	*11	199,284	1,346	1,546	0	0	0	11	11	31	0	5	264	300
Colorado	16	4	1	11	99,418	722	891	0	0	1	10	11	18	0	11	333	362
Illinois	81	42	0	39	198,611	2,346	2,335	0	0	0	16	16	32	0	1	421	454
Indiana	18	7	0	11	38,864	396	457	0	0	0	3	3	13	0	1	71	85
Kansas	105	44	3	58	388,701	3,168	3,125	0	0	0	23	23	76	2	19	565	662
Kentucky	53	19	3	31	70,955	1,098	826	0	0	0	14	14	26	0	1	230	257
Louisiana	63	29	8	26	438,022	2,355	2,446	4	3	0	14	21	76	35	41	318	470
North	28	11	1	16	109,107	982	1,288	0	0	0	8	8	20	1	3	129	153
South	26	13	6	7	238,080	1,097	1,158	3	2	0	4	9	44	30	26	167	267
Offshore	9	5	1	3	90,835	276		1	1	0	2	4	12	4	12	22	50
Michigan	4	3	1	0	13,542	274	322	0	0	1	0	1	5	0	1	93	99
Mississippi	9	2	0	7	65,720	273	295	0	0	0	5	5	12	1	1	116	130
Montana	13	5	0	8	63,179	247	199	0	0	0	5	5	10	0	0	75	85
Nebraska	17	8	0	9	100,001	628	483	1	0	0	4	5	27	0	0	278	305
New Mexico	42	25	8	9	192,142	1,173	1,011	0	0	0	7	7	32	0	6	111	149
Northwest	17	7	8	2	72,804	462	322	0	0	0	2	2	4	0	5	35	44
Southeast	25	18	0	7	119,338	711	689	0	0	0	5	5	28	0	1	76	105
North Dakota	6	4	0	2	38,210	151	141	1	0	0	2	3	8	0	0	38	46
Ohio	27	14	8	*5	74,616	607	693	0	0	0	0	0	0	0	1	5	6
Oklahoma	194	107	9	78	628,788	5,339	5,411	2	0	0	14	16	79	16	26	436	557
Pennsylvania-New York	2	0	2	0	6,480	633	974	0	0	0	0	0	0	0	6	10	16
Texas	454	280	25	149	2,004,834	13,539	12,415	14	1	5	99	119	467	23	117	2,877	3,484
Southwest (1 & 4)	69	25	7	37	281,276	2,013	1,903	2	0	2	24	28	88	5	43	544	680
Gulf Coast (2 & 3)	55	31	4	20	368,766	1,625	1,575	0	0	0	14	14	44	11	39	432	526
East (5 & 6)	16	9	2	5	75,704	668	604	0	0	0	4	4	10	1	5	237	253
N. Central (7-B & 9)	157	82	7	68	555,958	4,880	4,676	8	0	2	39	49	204	0	6	1,158	1,368
West (7-C & 8)	119	101	0	18	556,742	3,535	3,034	3	0	0	16	19	109	0	9	461	579
Panhandle (10)	38	32	5	1	166,388	818	623	1	1	1	2	5	12	6	15	45	78
Utah	4	3	0	1	18,805	79	48	1	0	0	1	2	3	0	3	41	47
West Virginia	18	1	14	3	38,806	396	368	0	0	0	0	0	0	0	6	7	13
Wyoming	13	8	0	5	64,053	490	509	0	0	0	3	3	9	0	7	122	138
Miscellaneous	0	0	0	0	0	64	21	0	0	0	0	0	4	0	0	52	56
Total U. S.	**1,208**	654	84	470	4,825,381	35,921	35,034	25	4	7	233	**269**	954	77	257	6,576	7,864
Total previous week	1,234	673	70	491	4,698,770			25	0	5	255	285	927	73	250	6,342	7,592
Total Aug. 13, 1955	1,067	531	77	459	4,171,951			30	8	7	210	255	1,012	132	228	6,059	7,431
Cumulative 1956	35,921	19,687	2,393	13,841	145,323,942												
Western Canada	80	63	5	12	412,112	1,774											

Service well included: *4.

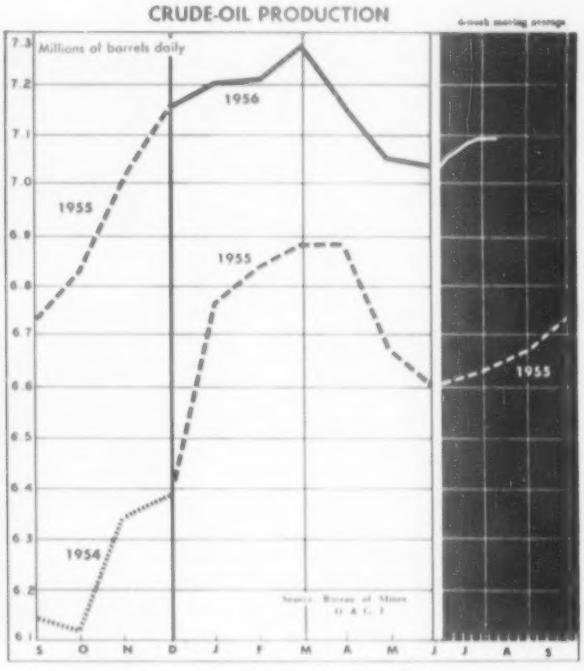
CRUDE IMPORTS



PRODUCT IMPORTS



CRUDE-OIL PRODUCTION

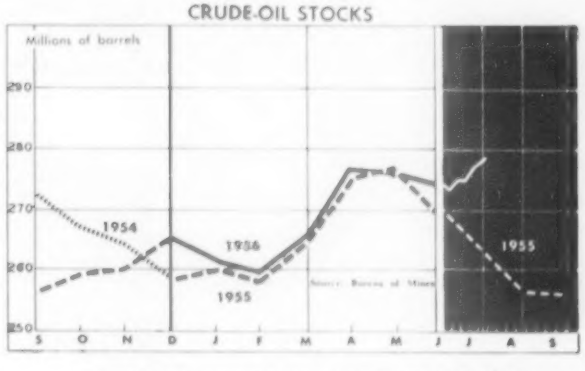


DAILY AVERAGE PRODUCTION FOR WEEK

	August 11, 1956			Aug. 4
	Crude oil	Lease condensate	Total	total
Alabama	7,600		7,600	7,400
Arkansas	75,550	450	76,000	75,700
California	960,800		960,800	959,600
Colorado	156,300		156,300	166,500
Eastern	50,100		50,100	50,200
Florida	1,375		1,375	1,275
Illinois	228,700		228,700	227,600
Indiana	31,100		31,100	30,700
Kansas	342,300		342,300	346,600
Kentucky	48,400		48,400	48,300
Louisiana	735,200	55,600	790,800	787,175
North	121,200	2,100	123,300	123,100
South	614,000	53,500	667,500	664,075
Michigan	28,500		28,500	27,800
Mississippi	107,900	4,650	112,550	112,200
Montana	62,700		62,700	63,100
Nebraska	37,200		37,200	39,400
New Mexico	229,300	3,800	233,100	239,025
North Dakota	37,600		37,600	36,800
Oklahoma	560,700		560,700	567,100
Texas	2,980,500	47,800	3,028,300	3,012,875
Dist. 1	56,000	425	56,425	56,425
Dist. 2	146,000	7,925	153,925	154,500
Dist. 3	436,000	22,400	458,400	457,250
Dist. 4	239,000	5,700	244,700	241,850
Dist. 5	43,000	350	43,350	43,925
Dist. 6	125,000	5,300	130,300	129,150
East Texas field	210,500		210,500	210,500
Dist. 7-B	158,000	50	158,050	156,900
Dist. 7-C	190,000	3,700	193,700	189,125
Dist. 8	1,060,000	1,500	1,061,500	1,058,650
Dist. 9	217,000	300	217,300	216,150
Dist. 10	100,000	150	100,150	98,450
Utah	4,900		4,900	5,100
Wyoming	287,300		287,300	286,400
Others	‡200		‡200	300
Total U. S.	6,974,225	112,300	**7,086,525**	7,091,150
Change from previous week, down			**4,625**	
Canada	†429,500		†429,500	†§429,980
Total U. S. production January 1-August 11			1,601,807,095 bbl.	
Same period last year (crude plus cond.)			*1,504,935,666 bbl.	

*Includes 25,049,875 bbl. condensate. †Week ended previous Monday. ‡Nevada. §Revised.

CRUDE-OIL STOCKS



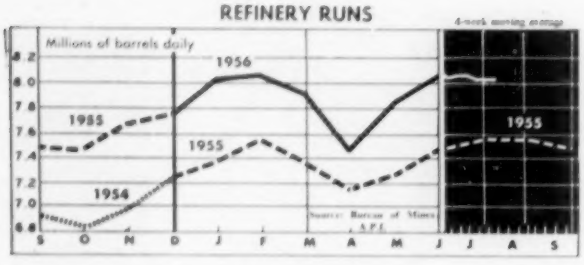
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

(Thousands of barrels)

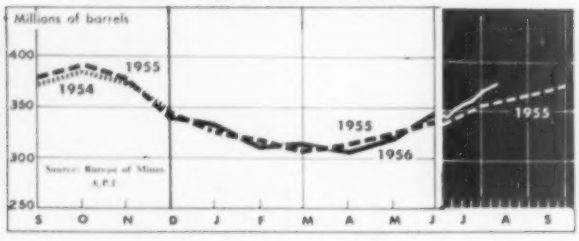
	8-4-56	7-28-56	8-6-55
Pennsylvania Grade	2,488	2,529	2,759
Other Appalachian	2,432	2,336	2,069
Illinois, Indiana, Michigan	10,485	10,521	11,320
Nebraska, North Dakota	2,905	2,403	2,079
Kansas	9,462	9,712	7,845
Oklahoma	27,102	27,197	21,806
Arkansas	2,851	2,809	2,799
Louisiana	16,840	16,253	16,673
North	2,624	2,601	2,721
South	14,216	13,652	13,952
Mississippi	3,265	2,976	2,864
New Mexico	7,993	8,162	8,448
Texas	123,442	122,133	124,520
East Texas proper	9,179	8,986	9,395
West Texas	59,597	60,135	57,423
Texas Gulf	23,055	22,275	24,802
Other Texas	31,611	30,737	32,900
Wyoming	20,447	20,137	14,673
Other Rocky Mountain	6,838	7,157	5,129
California	27,337	28,006	30,366
Foreign	†15,156	14,709	12,276
Total	279,043	277,040	265,626

*Bureau of Mines. †Includes 4,012,000 bbl. in California.

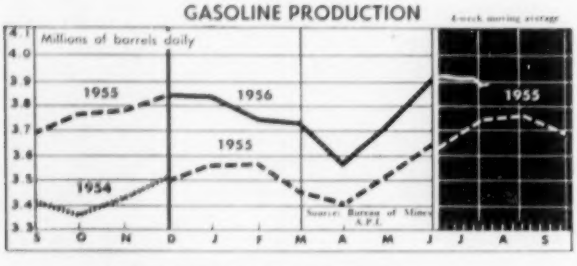
REFINERY RUNS



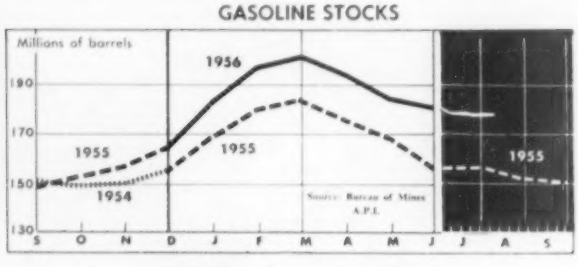
FOUR-PRODUCT STOCKS



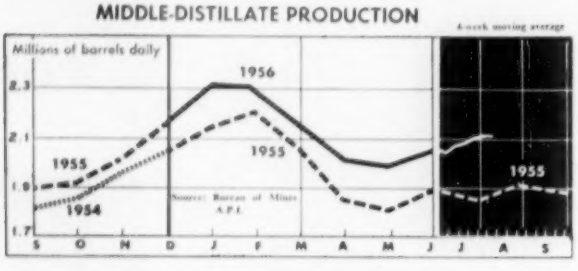
GASOLINE PRODUCTION



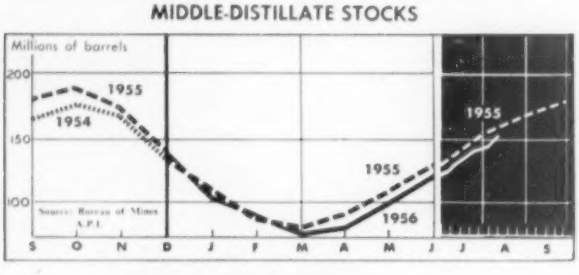
GASOLINE STOCKS



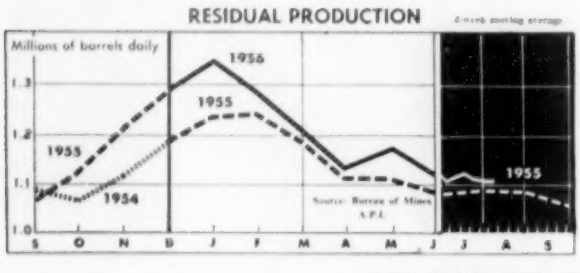
MIDDLE-DISTILLATE PRODUCTION



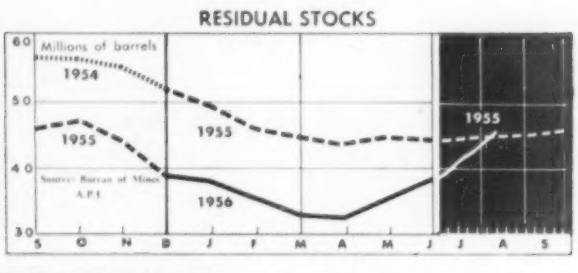
MIDDLE-DISTILLATE STOCKS



RESIDUAL PRODUCTION



RESIDUAL STOCKS



A.P.I. REFINERY REPORT, AUGUST 10

(Thousands of barrels)

District—	Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.	Stocks‡ Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, August 1955 Daily avg. runs	Daily average production— Gaso.*	Kero.	Dist.	Resid.
East Coast	1,159	519.4	34.4	277.5	180.0	41,925	11,187	42,198	12,017	1,056	454.6	23.4	268.0	193.0
Appalachian:														
District 1	88	32.6	1.4	22.3	2.6	4,543	544	2,788	553	92	38.1	3.8	21.7	5.0
District 2	99	47.7	6.1	17.4	12.0	2,839	759	882	539	100	56.4	2.6	11.5	13.2
Ind., Ill., Ky.	1,415	721.4	101.9	247.4	156.0	31,643	6,271	17,630	5,449	1,372	735.2	65.8	263.1	146.6
Minn., Wis., Dak.	70	36.1	4.0	19.1	4.9	6,891	1,366	6,785	250	(§)	(§)	(§)	(§)	(§)
Okla., Kans., Mo.	711	382.9	15.7	179.6	39.6	15,528	1,840	12,169	1,445	686	389.6	15.3	157.8	20.7
Inland Texas	265	202.1	6.4	55.6	24.4	6,771	502	1,882	1,543	257	181.3	8.4	51.3	20.8
Texas Gulf Coast	1,989	932.9	119.6	481.3	253.7	24,206	3,667	16,236	6,902	1,864	887.8	102.0	436.7	256.3
La. Gulf Coast	731	369.7	45.4	198.0	42.0	9,929	2,202	6,455	1,656	676	341.2	51.7	173.3	48.7
N. La. and Ark.	104	32.6	5.6	24.7	6.9	4,752	586	1,892	168	94	35.9	7.3	22.6	5.8
Rocky Mountain:														
New Mexico	22	10.7	0.3	3.6	2.4	413	10	93	18	21	11.4	0.2	3.7	3.2
Other Rocky Mtn.	285	128.9	2.0	65.3	37.1	5,995	380	3,053	890	278	130.0	3.7	58.0	37.3
California	1,111	516.0	1.6	168.3	361.1	22,122	318	12,110	14,111	1,084	511.2	5.3	152.9	339.5
Aug. 10, 1956	8,049	3,933.0	344.4	1,760.1	1,122.7	177,557	29,632	124,173	45,541	7,580	3,772.7	289.5	1,620.6	1,090.1
Aug. 3, 1956	7,964	3,863.6	264.9	1,834.4	1,078.7	177,561	¶29,415	119,289	44,598					
Aug. 12, 1955	7,670	3,792.3	295.3	1,623.3	1,141.4	154,983	32,811	122,214	45,705					

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines. §Included in Indiana, Illinois, and Kentucky. ¶Revised.

Crude-Oil and Refinery Prices at Representative U. S. and Foreign Points

REFINED-PRODUCT PRICES

Following quotations are for refinery products in cents per gallon moving in interstate shipments on Wednesday each week unless otherwise noted. Crude-oil prices are per barrel at the wells unless otherwise listed.

GASOLINE*

Mid-Continent (Group 3):	
★ Regular (88 octane)	11.25-11.75
★ Premium (96 octane)	13.25-13.75
Gulf Coast (cargoes for coastwise or export movement):	
Regular (90 octane)	11.25-11.50
Regular (92 octane)	11.50-12.00
Premium (97 octane)	13.00-13.25
Premium (98 octane)	13.25-13.75
California—Los Angeles (rack):	
Regular (84 octane)	12.9-13.3
Premium (93 octane)	14.9-15.3
Caribbean area (cargoes):	
Regular (87 octane)	10.50
Premium (93 octane)	11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

NATURAL GASOLINE*

Group 3:	
Grades 26-70	4.5
Breckenridge:	
Grade 26-70	4.0

*If 26-70 natural is considered as 100 per cent, prices for lower-vapor-pressure grades increase 2.5 per cent for each unit drop in Reid vapor pressure down to and including 16-lb. Prices for grades below 16-lb. may vary slightly by areas or plants.

KEROSINE AND DISTILLATE

Mid-Continent (Group 3):	
Kerosine 42-44	9.75-10.00
Diesel oil (58 d.i. and above)	9.625-9.875
Distillate No. 1	9.625-9.875
Distillate No. 2	8.75-9.00
Gulf Coast (cargoes):	
Kerosine 41-43	9.125
Distillate No. 2	8.50
New York Harbor (barges):	
Kerosine 41-43	10.85
Distillate No. 2	10.35
Diesel fuel, 48-52 d.i.	10.65
Caribbean area (cargoes):	
Distillate No. 2	8.50

WAX (LB.)

Oklahoma (Group 3):	
132-135 A.m.p. (semi-refined) in tank cars	6.50
New York (export):	
126-130 A.m.p. crude scale (solid in bags or barrels)	7.35

★Denotes change from previous week.

RESIDUAL FUEL (BBL.)

Mid-Continent (Group 3):	
Residual fuel (max. 1% S)	$2.00-2.10
Gulf Coast (cargoes):	
Bunker C fuel	$2.10
New York Harbor (barges):	
Bunker C fuel	$2.80
Caribbean (cargoes):	
Bunker C at Aruba, N.W.I.	$2.10
California (rack):	
Bunker C fuel, Los Angeles	$2.15-2.25

LUBRICATING OILS

Mid-Continent (Group 3):	
150-160 bright stock, solvent refined, 0-10 p.p., 95 v.i.	24
200 vis. neutral oil, solvent refined, 0-10 p.p., 95 v.i.	20.75
Pennsylvania Grade:	
★ 145-155 vis. at 210, bright stock, 8 color, 25 p.t.	27
★ 200 vis. neutral (180 at 100°), 25 p.t.	25

CRUDE-OIL PRICES

GRAVITY SCHEDULE

	Signal Hill, Calif.	Mid-Cont.*	Gulf Coast Tex.†	West Tex.‡ N.M.	Wyo (sour)
14-14.9	$2.02				
15-15.9	2.08				
16-16.9	2.13				
17-17.9	2.19				
18-18.9	2.24				
19-19.9	2.30				
20-20.9	2.35	$2.50		$2.37	
21-21.9	2.41	2.52		2.39	
22-22.9	2.47	2.54		2.41	
23-23.9	2.52	2.56		2.43	
24-24.9	2.58	2.58	$3.01	2.45	
25-25.9	2.64	2.60	3.03	2.47	$2.13
26-26.9	2.69	2.62	3.05	2.49	2.19
27-27.9	2.76	2.64	3.07	2.51	2.24
28-28.9	2.83	2.66	3.09	2.53	2.29
29-29.9	2.91	2.68	3.11	2.55	2.34
30-30.9	2.97	2.70	3.13	2.57	2.39
31-31.9	3.04	2.72		2.59	2.44
32-32.9	3.12	2.74		2.61	2.48
33-33.9	3.20	2.76		2.63	2.52
34-34.9	3.27	2.78		2.65	2.56
35-35.9	3.34	2.80		2.67	2.60
36-36.9	3.39	2.82		2.69	2.64
37-37.9		2.84		2.71	2.66
38-38.9		2.86		2.73	2.68
39-39.9		2.88		2.75	2.70
40 and up		2.90		2.77	2.72

*Includes Oklahoma, Kansas, North Dakota, West Texas (sweet), North Central Texas, North Louisiana, Arkansas. †Low-cold-test Gulf Coast. ‡Sour.

Effective dates: California, February 7, 1956; east of California, June 15, 1953; Pennsylvania Grade, August 16, 1956.

Some crudes in North Central Texas, West Central Texas, and Texas Panhandle have been shifted to the intermediate schedule with $2.83 for 40° and 2 cents per degree drop. Effective dates range from July 15, 1956, to August 10, 1956.

FLAT PRICES

Louisiana:	
Cotton Valley (distillate)	$3.00
Cotton Valley (Holloway crude)	2.95
Texas:	
East Texas	2.90
Chapel Hill	2.83
Conroe	3.13
Van	2.73
Pennsylvania Grade:	
★ Bradford	4.68
★ Middle District	4.50
★ Southwest Pennsylvania	4.21
West Virginia	4.03
Buckeye Grade	3.97
Zanesville Grade	3.15
Illinois Basin	**2.90**
Canada:	
Leduc-Woodbend (flat prices D-2, D-3)	2.60
Redwater (Alta.) D-3	2.49
Smiley-Viking (Sask.)	2.26
Fosterton (Sask.)	1.29
Pembina	2.52

FOREIGN

Venezuela:	
Cumarebo, 48°-49.8°, Tucupido	*3.40
San Joaquin, 41°-41.9°, Puerto La Cruz	*3.04
Oficina, 35°-35.9°, Puerto La Cruz	*2.80
Tia Juana medium, 26.5°-26.9°, Amuay§	‡2.30
Quiriquire, 16.5°-16.9°, Caripito	‡2.21
Lagunillas heavy, flat, Amuay or Las Piedras§	2.05
Bachaquero, 16.5°-16.9°, Amuay or Las Piedras§	‡1.90

*Plus or minus 2 cents per barrel for each degree gravity change. †Plus or minus 2.5 cents per barrel for each half-degree gravity change. ‡Plus or minus 3.5 cents per barrel for each half-degree gravity change. §Also available at La Salina at 3.0 cents per barrel less.

Middle East, Persian Gulf (cargoes, f.o.b. lifting port):	
Arabian, 36.0°-36.9°, Ras Tanura	$1.97
Iranian, 34.0°-34.9°, Bandar Mashur	1.91
Iranian, 34.0°-34.9°, Abadan	1.86
Iraq, 36.0°-36.9°, Fao	1.87
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi	1.72
Qatar, 39.0°-39.9°, Umm Said	2.06
Middle East, E. Mediterranean:	
Arabian, 36.0°-36.9°, Sidon	2.46
Iraq, 36.0°-36.9°, Tripoli, Banias	2.46
Far East (cargoes, f.o.b. Lutong, Sarawak):	
Seria Light, 37°-38°	2.60

TANKER RATES PER LONG TON

(Latest reported spot fixtures)

★ Gulf-U.S.N.H., dirty (USMC+50%)	$4.28
★ N.W.I.-U.S.N.H., dirty (USMC+35%)	3.64
★ N.W.I.-U.K., dirty (Scale+70%) (55s. 3d.)	7.69
★ Lebanon-France, dirty (USMC+30%)	7.08
★ Lebanon-U.K., dirty (Scale+100%) (56s. 8d.)	7.89

Your MARKET PLACE FOR THE OIL AND GAS INDUSTRY...

CLASSIFIED ADVERTISING

UNDISPLAYED CLASSIFIED 25c a word one issue. 10% Discount three or more consecutive issues. $4.00 minimum charge. Blind Box in our care nine words. Payable in Advance.

DISPLAY CLASSIFIED
$16.00 a column inch one issue . . . . 10% Discount three or more consecutive issues.

Address Classified Advertising Material: The Oil and Gas Journal, P. O. Box 1260, Tulsa 1, Okla.

FOR SALE EQUIPMENT

UPSET TUBING (23,000') 2⅜" O.D. new electric weld Range 2, External Upset tubing, 8 Rd. thd. Immediate delivery. Write Box J-663, The Oil and Gas Journal, Tulsa, Oklahoma.

FOR SALE: 6700 feet 8⅝" O.D. 17.50# New National Seamless Casing. T. & C. Range 1. Midway Supply Company, Jackson, Michigan.

ALL NEW MODEL AL60 Cardwell Trailer Rig, Cuba, New Mexico. Equipped for slim hole drilling to 5000 feet, or large diameter water hole. Will sell outright or trade for larger trailer rig. Apache Drilling Company, 323 Simms Building, Albuquerque, New Mexico, 3-0224.

FOR SALE—At our Arkansas City, Kansas Gasolene Plant, two 150 hp. Vogt bent type Water Tube Boilers, 200# WP, Serial No. 18846-1 and 2, mounted on steel structural frame, both boilers equipped with breeching for one 48" x 60' stack. Not dismantled. Price for lot $3500.00. Cities Service Oil, Patridge, Bartlesville, Oklahoma.

FOR SALE

Choice of any two of the following complete rotary drilling rigs:

One U-15 powered by 2 NKR Waukesha engines

Two U-15 powered by 3 NKU Waukesha engines

One U-15 powered by 2 LRO Waukesha engines

One M-58 Bethlehem powered by 2 LRO Waukesha engines

All of the above rigs are now operating in the Abilene, Texas area. For further information or inspection of the rigs contact:

HENSON DRILLING COMPANY
P. O. Box 2192, Telephone ORchard 2-4112 or ORchard 3-3071
Abilene, Texas

LIQUIDATING

PURE OIL REF., CHARLESTON, W. VA. AND BAY REF., McPHERSON, KANSAS

TWO MODERN and COMPLETE REFINERIES

All equipment and machinery for sale at fraction of original cost.

WRITE FOR CATALOGUE

BROWN-STRAUSS CORPORATION
1546 Guinotte Ave., Kansas City, Mo.
Phone HA 1-1000

Field Office: Cabin Creek (suburb of Charleston, W. Va.)

Phone East Bank 5611, Roy Crisp, Mgr.
P. O. Box 2921, Charleston, W. Va.

FOR SALE EQUIPMENT

OIL WELL CASING, (26,000') 6⅝" O.D. 18# New electric weld Range 3, hydrostatically tested, 7¼" long API 8 Rd thd. collars excellent substitute for 5½" O.D. 17# or 7" O.D. 17-20# casing. Some new EUE tubing also available. Box J-664, The Oil and Gas Journal, Tulsa, Oklahoma.

CARDWELL MODEL "S", double drum with WAK Waukesha, 87 foot Moore mast, folding platform, substructure; Emsco 7½ x 14 pump with two WAK Waukesha; rotary, block, hook, kelly, swivel, BOP, light plants, tool house, bunk house, miscellaneous equipment. Box 3246, Corpus Christi, Texas.

FOR SALE
Aluminum Line Pipe, 26,600' of 6⅝" O.D. 2.80 Wall, 6.556#, 40' lengths, located Magnolia, Arkansas. Also have large stock New & Used Casing, Tubing, Surface Pipe & Line Pipe.
Sabine Pipe & Supply Co.
Phones 3094 - 3095
Kilgore, Texas

FOR SALE EQUIPMENT

CORE DRILLS, SPUDDERS, ROTARIES. New and used equipment. Everything in supplies. Fishing tools rented. Pressey & Son, Pueblo, Colo.

GASOLINE PLANT EQUIPMENT FOR SALE

1—800# 20 MMCF Absorber with Scrubber, etc.
1—6 Cyl. Buda Engine, 243 H.P. at 900 RPM with Starting Engine.
1—Fluor "Counterflo" Induced Draft Cooling Tower Complete.
2—20 MMCF LTX Units.
Vessels, Generators, Pumps, Instruments, Pipe, Valves, and Fittings and Other Equipment necessary in Gasoline Plant Construction. Detailed Inventory Available upon request.

Southern Production Company, Inc.
P. O. Box 670 Phone—EDison 2-8101
FORT WORTH, TEXAS

LIQUIDATION!

NEAR LONGVIEW, TEXAS — **IN STOCK**

COMPLETE POLY UNIT, BUILT 1950 UOP RATED 144 BBL./DAY

1—Wyatt 30" x 70' Stabilizer 160# 30 tray
20—Brown fintube exchangers, 600# 140 sq. ft. 4-6 chrome.
20—Brown fintube exchangers, 600# 11, 21, 77, 101, 140 sq. ft.
5—Adm. Heat Exchangers, 644, 424, 346, 176 sq. ft.
1—5' x 96' tower, 40 tray, 135# WP.
1—6' x 34' Vacuum tower, 150#.
1—2' x 50' tower, 24 trays.
5—Welded tanks, 10' x 40', 10' x 30', 5' x 20'.
7—Oilfield boilers, 100 hp., 275#.
1—Ethyl lead plant.
2—Convection furnaces, 20 MIL BTU/hr.
1—Vapor phase cracking furnace.
12—Welded storage tanks, 5,000, 2,000, 1,000 bbl.
8—Hi-vol pumps, 10 x 7 x 18e 10 x 6 x 12, 6 x 4 x 12, 6 x 3 x 8.
30—Duplex piston pumps, all sizes.
1—10' x 30' asphalt still.
6—Steel Bldgs., 20 x 150, 20 x 20, 20 x 40.
1—BS&B Oil and gas separator, 10.7 mcf, 3500 Bbl./day.
Large Selection of Series 15, 30 Steel Valves, 1" to 8".
Approximately 15,000 ft. Schedule 40, 80 pipe, 2" to 8".

HEAT EXCHANGERS
10—Kellogg Adm. Fltg. Hd. 2700, 2200, 1800 Sq. Ft.
6—Kellogg Steel Fltg. Hd. 1500, 800, 500 Sq. Ft.

COMPRESSORS
2 Worth LTC-6 800 hp.
1 Worth LTC-3 400 hp.
3 Penn Comps 100 CFM 500 lbs. 385 CFM 160 lbs.

MISCELLANEOUS
6—Adm. 785, 742, 425 sq. ft. ht. exch.
30—304 SS shell & tube condensers 100-1000 sq. ft.
Lab Petro-Chem furnace 50,000 BTU/hr.
800 ft. of 2" 4-6 ch pipe.
Large quantity of 410 SS chrome strips and sheets.
Tremendous selection stainless steel and steel valves ½"-6".
BJ hot oil pump 3 x 9, 13 st, 325 gpm, 4600' hd.
Goulds 16" pump, 10500 gpm, 135' hd

PARTIAL LIST ONLY

WIRE! PHONE! WRITE!
FOR DETAILED CIRCULAR

BRILL EQUIPMENT COMPANY
4101 San Jacinto St., Houston 4, Texas, JA 6-1351
or
2401 Third Ave., New York 51, N. Y., CYpress 2-5703

FOR SALE EQUIPMENT

SMALL MACHINE and Welding Shop with portable equipment all in good condition. Gale Kelly, Cement, Oklahoma.

COMPRESSER BUILDING — Structural steel, 12' x 35' x 120. Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

100,000'—6⅝" O.D. x .219" Wall DRL/PEB New Electric Weld Pipe ASTM A-139 Pressure Tested 1400 lbs. Immediate Mill Delivery.
Price—$1.76 per ft. F.O.B. Mill.
TYLER-DAWSON SUPPLY COMPANY
6310 E. 13th Street
Tulsa, Oklahoma
Phone: TEmple 5-7601

Gaso Duplex 4½" x 6" Power Pumps with Chrysler C-36 Engines, skid mounted, immediate delivery. Also Byron Jackson, Carter Centrifugal Units. Westinghouse 20-25-50 KW Generating Units.
H. H. COFFIELD
Attn: W. H. ORR
Phones: 132—Rockdale, Texas
AT-3427—Houston, Texas

LINE PIPE

33,000 ft., 6⅝ in.	**18.97**
70,000 ft., 4½ in.	**10.97**

No. 1, used, machine cleaned and straightened.
CUMBERLAND CONTRACTING CO.
Owensboro, Ky. Phone MUrray 90874

LIQUIDATIONS
Now in Progress
PHILLIPS OIL REFINERY,
Pocatello, Idaho
SUNRAY GASOLINE PLANTS,
Drumright, Okla.
Stillwater, Okla.
For detailed inventory
WRITE—WIRE—PHONE
Heat & Power Co., Inc.

New York Office	**Tulsa Office**
60 East 42 St.	310 Thompson Bldg.
New York 17, N.Y.	Tulsa 3, Okla.
Murray Hill 7-5280	Diamond 3-4890

Stop Tong Breakage!
ARMITE DRILL COLLAR & TOOL JOINT COMPOUND
ARMITE LABS., 6609 Broad St., Los Angeles 1, Calif.
Petro. Industries Consultants, C.A. Caracas, Venez.

FOR SALE

143 Joints 4256'9" of 5½" 21.90# Grade D Youngstown API IUE R-2, Seamless Drill Pipe (New), Complete with 143 7" OD x 4" ID Hughes API Full Hole Counter Bore Welded Tool Joints.

SOHIO PETROLEUM COMPANY
Attn: J. R. Wilson, Jr., Purchasing Agent
1300 Skirvin Tower Hotel
Oklahoma City 2, Oklahoma
Phone: Regent 9-0511

BUSINESS SERVICE

Delaware Corporations formed and serviced. American Guaranty & Trust Company, P. O. Box 487, Wilmington, Delaware.

FOR SALE EQUIPMENT

SALES AND RENTALS. Used cable drilling and fishing tools, casing, production equipment; from the Southwest's largest stock of oil field supplies. Degen Pipe and Supply Co., Tulsa.

FOR SALE: National 50 Drilling Rig Complete, for details, call or write Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

93,000 FEET 4½" O.D. New Seamless Pipe weight 15.20 per foot 1035 steel High Pressure located Sherman, Texas. Price reasonable. Lun-Dow Company, Box 1218, Tulsa, Phone LU 5-8850.

1 C34 WALKER-NEER SPUDDER. Complete. New drilling and sand lines. 5" and 7" tools and tubing tools. Phone 20, or write Box 788, Drumright.

1-71 STAR SPUDDER — Semi-mounted—Butane equipped—new 1955—new lines—4 to 8 inch tools—dog house—light plant—core barrel — numerous small tools — 1954 F-7 Ford Truck—water tank—junk box, etc. 2 Producing oil wells—650 feet—550 acre lease with many proven locations $30,000 complete. E. Wagner, 1641 S. Main, Ottawa, Kansas. Tel. 1885J.

FOR SALE EQUIPMENT

Misc. Sizes 2" to 4½" OD Line Pipe #1 Used. Available for inspection and immediate delivery out of inventory.
MERCURY OIL REFINING COMPANY
Oklahoma City, Oklahoma
P. O. Box 1128 MElrose 8-3383

FOR SALE EQUIPMENT

FAILING HEAVY DUTY 1500, long mast, kelly, Failing 750 cheap, Sullivan 1000, $3,750.00. Fred Butler, Box 481, Pueblo, Colo.

GAS COMPRESSORS—3 Bessemer type 10 twins direct connected units—Boswell-Frates Company, 1003 Kennedy Building, Tulsa, Oklahoma.

FOR SALE: One double rack oil loading rack capable of handling 20 cars on each side or a total of 40 cars double railroad track, with 10" main line and 3" risers and spouts to cars. This is not a shop made rack but was made by Black, Sivalls and Bryson. If interested, advise and quotation will be given. Louisiana Iron & Supply Co., Shreveport, Louisiana.

FOR SALE—Fairbanks Morse Alternating Generator, KVA 40, RPM 1200, ph. 3, Cy 60, Volt 240, complete control board, all excellent condition, $275.00. W. Caplis, Box 1313, Shreveport, Louisiana.

FOR SALE at our Tallant Chemical Plant —One steel smoke stack 3'8" x 100' high with rectangular base ⅛" steel. Lowered ready for truck movement. $500.00. Cities Service Oil Company, Bartlesville, Oklahoma. H. D. Patridge.

FOR SALE

30,000 ft. of J-55 Seamless 5½" casing like new. Immediately available Tulsa area. Dealer protected. Contact:
Gerald T. Shipman
Short Hills, New Jersey
Phone Drexel 62215

FOR SALE
IMMEDIATE DELIVERY
OIL COUNTRY GOODS

35,000'	5½" OD 13#	E.W. RANGE 2	8 RD. THRD.
18,000'	5½" OD 14#	SMLS. RANGE 2	8 RD. THRD.
12,000'	5½" OD 17#	SMLS. RANGE 3	8 RD. THRD.
50,000'	6⅝" OD 18#	E.W. RANGE 3	8 RD. THRD.
25,000'	7" OD 20-23-26#	SMLS. RANGE 2-3	8 RD. THRD.
1,500'	9⅝" OD 32-30#	SMLS. RANGE 2	8 RD. THRD.
8,000'	9⅝" OD 40#	RANGE 2-3	8 RD. THRD.
60,000'	2⅜" OD EUE TUBING	E.W. RANGE 2	8 RD. THRD.
30,000'	2⅜" OD EUE TUBING	SMLS. RANGE 2	8 RD. THRD.
25,000'	2⅞" OD EUE TUBING	SMLS. RANGE 2	8 RD. THRD.

Other items line pipe, casing and tubing available, contact.
A. J. Strubel, 4946 Murdoch, St. Louis, Missouri,
Office—PRospect 2-2100, Residence—FLanders 1-8152

USED MAST — SLUSH PUMP — ENGINES — ROTARY
Located Near Andrews, Texas

133' Ideco Full View Mast with 10' high Substructure for three Engines, with Walkway, Ramp and Stairways (**like new — drilled three wells**).

D-500 Emsco 7½"x16" Pump with V-Belt Sheave, V-Belts and Guard.

G-300 Gumbo Buster (AW&P Co.) 7¼"x14" Pump with V-Belt Sheave, V-Belts and Guard.

Three 6LRO Waukesha Power Units with Caterpillar Clutches and Butane equipment.

HS-23" Ideco Rotary Table with Master Bushing and Sprocket.

2RBS4 Baash-Ross Roller Kelly Bushing for 4¼" Square Kelly.

PIPE EXCHANGE SERVICE
(Request TIP SHEET #250)
Distributors for CF&I — Lone Star — Pittsburgh — Wheeling
Leaders in Foreign Tubular Products

PRODUCTS LUCEY CORPORATION — LUCEY PRODUCTS CORPORATION — TULSA, OKLAHOMA

OKLAHOMA CITY • DALLAS • SHREVEPORT • ODESSA
DENVER • LOS ANGELES • CALGARY

EQUIPMENT WANTED

WANTED: one 7¼ x 14 slush pump, late model. Give asking price, condition, serial number, etc. Fawcett Machine & Supply, 949 McCarty, Houston 29, Texas.

CASH FOR WELL servicing unit, 2500' capacity rotary, 5 x 8, 5 x 10 mud pump. Fred E. Butler, Box 481, Pueblo, Colo.

DOUBLE DRUM servicing machine to 3,500'. Mounted on 6 x 6 truck. Not more than three years old. For Ohio Delivery. Oil Development Co., 1878 E. 18 St., Cleveland.

HELP WANTED

DRILLING SUPERINTENDENT—Age 29-39. Experienced drilling engineer needed for work abroad. Live in town of a million population. Living expenses of family paid. Tax-free salary $15,000 bracket. Experience in oil field transportation and logistics. Box J-676, The Oil and Gas Journal, Tulsa, Oklahoma.

INSTRUCTOR or Assistant Professor with B.S. or M.S. degree in engineering to teach courses in Petroleum Production at Tulsa University. Contact Dean of Engineering or Head of Department.

HELP WANTED

ENGINEER — over one year experience. Train as assistant to General Sales Manager of Oil Tool corporation. Unusual opportunity for advancement while receiving top salary. Submit education and experience details. Our employees know of this ad. P. O. Box 7286, Houston 8, Texas.

WANTED SUB-SURFACE GEOLOGIST: Independent oil company has opening in Illinois for sub-surface geologist with 3 to 5 years experience. Must be familiar with tri-state area. Exceptional opportunity for aggressive man. Applicant should supply complete resume of education, experience, qualifications, references, and salary expected. All replies confidential. Reply Box J-681, The Oil and Gas Journal, Tulsa, Oklahoma.

PROCESS ENGINEER: To assist Sales Department of expanding independent oil company with wide variety of petroleum problems. Primary emphasis on crude and refined product quality evaluations for foreign markets. Require resourceful young man with 3-5 years refinery experience. Location San Francisco with infrequent short trips to Europe and Asia. Please submit experience and salary resume. Confidential. Box J-684, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

OIL INDUSTRY Employment Service, 405 Tuloma Bldg., Tulsa, Okla. Tom Robinson, owner. Send brief resume education, experience, age, family status.

ASSISTANT Refinery Superintendent; independent producer-refiner in Mid-Continent area has opening for man with broad experience in supervision of distillation units, treating, blending, etc.; plant located in a small town with a company which has a record of 25 years successful operation. Box J-652, The Oil and Gas Journal, Tulsa, Oklahoma.

FOREIGN EMPLOYMENT. List of oil companies and drilling contractors showing where to apply for foreign jobs. OIML Co., Box 2603, Tulsa, Okla. $5.00 cash.

GAS PIPELINE ENGINEER—Graduate, qualified for registration or registered. Mechanical, Civil, or Petroleum background. Immediate opening, experienced in construction, pipeline and compressor station design, and in pipeline economics and operations. Salary commensurate with experience and qualifications. Send resume with application. Chief Engineer, Mississippi River Fuel Corp., 407 N. 8th St., St. Louis 1, Mo.

SALES ENGINEER For California Oil Fields. Must have wide experience in selling, servicing, engineering and supervision of the installation of equipment for the treating, dehydrating, separating and handling of petroleum production. Chemical or petroleum production engineer preferred. Offshore production equipment experience helpful. Give complete details in first letter and salary requirements. Box J-650, The Oil and Gas Journal, Tulsa, Oklahoma.

PLANT ENGINEERS
(Natural Gasoline)

Permanent positions with excellent advancement opportunities with an expanding organization for Process, Design and Project Engineers. Degree in petroleum, mechanical or chemical engineering and three to eight years' experience required. Starting salary attractively commensurate with background and experience. All replies confidential. Send resume to:

WARREN PETROLEUM CORPORATION
BOX 1589
TULSA 2, OKLAHOMA
ATTENTION: R. L. LANE OR C. C. McKEE.

OPERATING ENGINEER
NEW YORK OFFICE

To assist in supervising office & field and domestic & foreign activities of the Operating Department.

Challenging opportunity for graduate chemical or mechanical engineer with minimum five years petroleum refining experience, preferably with contracting engineering firm.

Please airmail confidential verifiable chronological resume, including salary history, to

PERSONNEL DEPARTMENT:
HYDROCARBON RESEARCH, INC.
115 Broadway New York 6, N. Y.

DRILLING ENGINEERS
FOREIGN DRILLING OPERATION

Oil well drilling contractor has immediate opening for drilling engineers in Sicily and Africa. Liberal salary and bonus. Box J-679, The Oil and Gas Journal, Tulsa, Oklahoma.

Wellsite and Subsurface
GEOLOGIST

For small independent oil company operating in Ecuador, South America. Require 2 to 4 years experience. Excellent living conditions. Send full particulars on education and experience with references to:

JAMES L. CARLTON
P. O. Box 455
CASPER, WYOMING

PETROLEUM ENGINEERS

(Ages 25 - 38)

RESERVOIR and PETROLEUM PRODUCTION ENGINEERS are needed in the expanding organization of major U. S. oil company operating in South America. Vacancies exist for graduate petroleum, chemical or mechanical engineers at levels requiring five to ten years of pertinent experience. Salary, including bonus, approximately $14,000-$17,000 depending on qualifications and experience. Liberal employee benefits and home vacations with travel expenses. Send complete resume of personal data and work experience. Replies will of course be confidential and personal interviews will be arranged for qualified applicants.

BOX 480, DEPT. Y-21, NEW YORK 19, N. Y.

SUB-SURFACE GEOLOGIST

Nortex Oil and Gas Corp. has position now open for a SUB-SURFACE GEOLOGIST. Two to five years regional mapping experience in West and/or West Central Texas. Dallas location. Send complete resume of education and experience, including salary requirements. All replies confidential.

Chief Geologist
NORTEX OIL AND GAS CORP.
1900 Life of America Bldg.
Dallas, Texas

HELP WANTED

GOOD OPORTUNITY with company newly active in foreign work—MUD ENGINEER Age 25-35. Top ability petroleum engineer with three years Gulf Coast experience with drilling mud problems and general oil field operation. Salary $12,000 tax free, plus living expenses. Box J-677, The Oil and Gas Journal, Tulsa, Oklahoma.

SITUATIONS WANTED

DRILLING SUPT., Administrative background, 25 years experience in South America and Mexico, capable of assuming full charge of project. Single status, desires foreign employment. Box J-626, The Oil and Gas Journal, Tulsa, Oklahoma.

PRIVATE SECRETARY. Legal experience law firms. Available for independent oil corporation in Houston. Box J-680, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM EXPLORATION GEOLOGIST: desires responsible position with medium sized, independent, or integrated oil company. Eight years of diversified exploration experience in West Texas - New Mexico Area with major. Capable of evaluating and working up all types of geological prospects and trend plays. Thoroughly experienced in contouring regional and field maps. Box J-671, The Oil and Gas Journal, Tulsa, Oklahoma.

RESERVOIR ENGINEER Geologist with management experience, who has had 14 years experience with major and large independent desires position as reservoir or valuation engineer that involves responsibility and offers future; 36 years of age, married, with two children. Location U. S. Available immediately. Full references. Box J-667, The Oil and Gas Journal, Tulsa, Oklahoma.

MATERIAL ACCOUNTANT: Experienced in Control, Inventories, Valuations, Liaison, Purchasing, Production, and Drilling. Desires connection with aggressive company or independent. Box J-639, The Oil and Gas Journal, Tulsa, Oklahoma.

ENGINEER with radiation and geophysical experience, extensive knowledge of Middle West oil and mineral fields. Business background of economics and valuations. Considerable Civil Engineering and Design Drafting experience. Seeks progressive position—able to travel the world. Box J-682, The Oil and Gas Journal, Tulsa, Oklahoma.

SALES REPRESENTATIVE — Ten years supply store manager, eight years production. Business Degree TCU. Prefer Texas Gulf Coast or East Texas. Write Box 825, Denver City, Texas.

LEASE AND DRILLING BLOCKS

The following described producing oil leases MUST BE SOLD TO SETTLE ESTATE

No. 1 HENDRICKSON LEASE. E/2 NW/4 Sec. 25 T27 R8, Greenwood County, 2 mi. E, 1 mi. N, ½ E, 1 mi. N of Beaumont, Kansas. Four producing wells, 1 disposal. Producing from Peru sand; suitable for flooding. Room for additional wells, depth 1850', settled prod. approx. 4 bbls. daily per well. Wells furnish sufficient gas to run pumping engines.

No. 2 HARRIS LEASE: S/2 NW NE NW Sec. 24 T 24 R 12E Greenwood County, 3 mi. W, 1 mi. S, 1 mi. W, 1 mi. S, Virgil, Kansas. Mississippi lime well approx. 1715' daily prod. approx. 3½ bbls. On pipeline, electrically equipped.

No. 3 ANNA BOYER LEASE: NEc NE/4 Sec. 34 T25 R10 Greenwood County, 1 block E of tracks in Eureka, Kansas, on US54 and 6 blocks N on Cecil Jones place. Mississippi lime well, 1900'. Approx. prod. 5 bbls. daily. On pickup oil line, electrically equipped.

No. 4 LODGE LEASE: Block 5, Highland Park Addition to City of Eureka, Kansas, 2 blocks E of tracks on US54 and 2 blocks N. 1910'. Daily prod. approx. 5 bbls. On pickup oil line, electrically equipped.

For further information write or call Lloyd K. Jones, Box 128, Emporia, Kansas, Phone 680; or Mr. John Day Darrah, Legal Bldg., Wichita, Kansas, Phone Amhurst 2-7469.

ROYALTIES

HIGHEST PRICES PAID for choice oil and gas income royalties, overrides, oil properties. A. S. Berry, P. O. Box 1383, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

FOR SALE: Producing oil and gas wells and leases located in Garvin, Stephens, Kiowa Counties, Oklahoma. For details call or write Ralph W. Shebester, Box 337, Pauls Valley, Oklahoma. Telephone 570.

FOR SALE: New 108 acre, 10 year term oil and gas lease, P. Walker Survey, Shelby County, Texas, adjoining two major company blocks. Price $7.50 per acre. C. A. Parker, Box 507, Center, Texas.

North Chaves County, N. M.

Recommend to small or large buyers leases & royalty in Major Company blocks. Drilling or to drill. Developments indicate great potential possibilities. Data on request.

W. J. PETERMAN, GEOLOGIST
Exploration 1918-1956 Engineering
Portales, New Mexico

LEASES ROYALTIES

Producing and Nonproducing
Bought and Sold—Any Area
Inquiries Invited

B. D. BUCKLEY
6635 Delmar Ave., St. Louis, Mo.

SCOUTING

VENEZUELAN OIL SCOUTING AGENCY. Periodic reports—maps—newsletter. Mail: VOSA, Apartado 3963, Caracas. Cables: VOSA, Caracas. Telephone 544802. Neal VanMiddlesworth.

VENEZUELAN OIL SCOUTING AGENCY

Reports—maps—newsletter
Cable: VOSA, Caracas
Mail: Apartado 3963
N. VanMiddlesworth
Phone: 54 48 02

WANTED

WANTED: Leases for drilling. Consider outright purchase or give override. Give legal description and geology, if available. Box J-685, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED — Drilling and/or Production deals in Kansas and Oklahoma. Contact Fell & Wolfe Oil Co., Box 346, Tulsa.

WANTED TO PURCHASE

NICKEL SCRAP, RESIDUE SLUDGES, CATALYST WASTE, ALL TYPES OF CHEMICALS OF EVERY DESCRIPTION

DAVID WEISWASSER
155 No. 3rd. St.
Philadelphia 6, Pa.
Lombard 3-3141

PETROLEUM PRODUCTS

NOTICE

The National Iranian Oil Company offers for sale, during the year 1957, a total quantity of 3,660,000 long tons of Iranian Light Crude Oil in following quarterly quantities F.O.B. Bandar Mashur.

	U.S. Barrels	Long Tons
First Quarter	6,683,000	890,000
Second Quarter	6,840,000	910,000
Third Quarter	6,919,000	920,000
Fourth Quarter	7,076,000	940,000
	27,518,000	3,660,000

Main characteristics of the Crude Oil offered are:

Average Specific Gravity @ 60°F	0.8530 (34.39° A.P.I.)
Sulphur % Wt.	1.3 - 1.4%
Vapour Pressure	6.5 - 8.0 lbs. at 100°F
Salt Content	5.2 lbs. approx. per 1000 bbl.

Those interested are requested to indicate:

1. Price offered per barrel of 42 U.S. Gallons f.o.b. Bandar Mashur.
2. Quantity of crude oil required.
3. Period during which the required quantity will be lifted.
4. Currency in which payment will be effected. (Preference being given to payments in currencies of international convertibility).
5. Whether the purchaser is prepared to put up a performance bond.
6. Whether the purchaser would arrange for vessels carrying crude oil to be bunkered by the National Iranian Oil Company.
7. Banks to which reference can be made.

This offer is open until September 30th, 1956, and the National Iranian Oil Company will notify its acceptance or rejection of the proposals received before the 30th November, 1956.

The National Iranian Oil Company is also prepared to consider offer for long term contracts for the purchase of Iranian Light Crude Oil.

Proposals may be directed to the National Iranian Oil Company, Teheran, or to the Iranian Embassies, Legations, or Consulates abroad.

NATIONAL IRANIAN OIL COMPANY

REAL ESTATE FOR SALE

DOWN TOWN LOCATION Casper, Wyoming. Office building, warehouse and material yard, all or part. Casper Realty Company, 300 North Center, Phone 2-7345, Casper, Wyoming.

MOTELS, Income and a choice assortment of Wyoming's best cattle ranches. Casper Realty Company, 300 North Center, Phone 2-7345, Casper, Wyoming.

FOR LEASE: Lafayette, La., Entire air conditioned second floor, area 7500 square feet, tripie A building, on the most prominent corner in the city. Suitable for high class business or offices. Will lease all, or part. Call or write. E. Ostrich, 810 Jefferson St., Phone CE 54528.

ELECTRIC LOG CABINETS

FOR ECONOMICAL FILING of full-size electric logs, most geologists prefer Kraftbilt E-24 4-drawer cabinet. Two compartments to each drawer with separate follow blocks make this cabinet handy, economical. For filing reduced electric logs, geologists use Kraftbilt E-28 8-drawer cabinet. Send for new Catalog 1156-B. Ross-Martin Co., P. O. Box 800-A, Tulsa 1, Okla.

PRODUCTION WANTED

WANT TO BUY—Oil Properties, settled or semi-settled production. 100 to 5,000 barrels daily in Oklahoma and Kansas. Contact Morris Sitrin, 1215 First National Building, Tulsa, Oklahoma.

PRODUCTION WANTED

$40,000,000 TO INVEST in oil production, any part over $1,000,000, give full report. Tjaden, Eagle Lake, Texas.

PRODUCTION FOR SALE

FOR SALE—Shallow (1850') oil well in Humble Field, Harris County, Texas, for $3,500.00, making four barrels net oil per day. Can probably be increased to ten barrels of oil per day with light rework. Salvage worth $2,500.00 alone. Well only six months old. Box J-674, The Oil and Gas Journal, Tulsa, Oklahoma.

BUSINESS OPPORTUNITIES

INCORPORATE YOUR BUSINESS IN DELAWARE. Do business anywhere. Quickest! Cheapest! Brochure FREE. Write—Faultless Organization, 684 N. Sangamon, Chicago, Ill.

CAPITAL CONTACT. Will consider placing proposition requiring corporate financing on Underwriting basis. Confidential. Write Consultant, 817 51st St., Brooklyn, N. Y.

If interested in favorable leases, royalties or in drilling deals
Write
R. E. "BUCK" CLEMENT
Box 65 Norman, Oklahoma

Officers Chosen for 1956 Permian Basin Oil Show

Roy Carter, field manager of Carter Foundation Production Co., has been elected president of the 1956 Permian

RAY CARTER

A. R. DYER

Basin oil show. Other officers are A. R. Dyer, Abell Lumber Co., Odessa, first vice president, and J. W. (Ike) Love-

J. W. LOVELADY

C. P. CLOVER

lady, president of Sivalls Tank Co., Odessa, second vice president. Carlos P. Clover is general manager of the show again this year.

EQUIPMENT MEN . . . in the News

Three Regional Managers Named by American Iron

F. E. Wagner and Joe Thompson have been appointed regional managers by The American Iron & Machine Works Co. of Oklahoma City, and B. E. Sharp has been named Oklahoma district manager, according to Claude L. Griffin, sales manager.

B. E. SHARP

JOE THOMPSON

F. E. WAGNER

Wagner's area consists of California, Rocky Mountains, Kansas, Oklahoma, Illinois, and eastern Canada. Wagner joined American Iron in 1936, and has held sales positions mainly in Kansas, West Texas, and Oklahoma.

Thompson's district includes West Texas, North Texas, Texas Gulf Coast, Ark-La-Tex., and the Louisiana Gulf Coast. He started with American Iron in 1947, working in inspection and engineering until joining the sales force in the Kansas district. His headquarters will be in Houston.

Sharp joined American Iron in the engineering department in 1944. He has held a sales position in the Oklahoma district since 1948.

Franks Appoints South American Distributors

Franks Division, Cabot Shops, Inc., of Tulsa, announces the appointment of exclusive distributors in South America for its line of well-servicing units and rotary drilling rigs as follows:

East-West Oiltools, C. A., with distribution points at Puerto La Cruz, Venezuela, and Maracaibo, Venezuela, for the Venezuela and Colombia regions, and Servicios Petroleos, S. A., with headquarters at Lima, Peru, for the Peru-Ecuador area. This announcement was made by R. A. Baker, president, and S. E. Corry, sales manager, of Franks Division.

Sales and service personnel of both East-West Oiltools and Servicios Petroleros have recently completed a training course at Franks' Tulsa headquarters plant to become acquainted with Franks' complete line of drilling, well-servicing and work-over units.

McCullough Tool Announces Promotions, Appointments

The recent promotions of W. T. Trice, Jr., to South Louisiana district logging engineer and Roy Willig to sales engineer at Harvey, La., have been announced. Joe L. Brezny has been appointed sales engineer at McCullough's Sherman, Tex., branch, and Howard T. Baggett has been named sales engineer at the Rock Springs branch, according to I. J. McCullough, president.

Trice has been with McCullough for 2 years as logging engineer at Laurel, Miss., and city sales engineer in New Orleans. Willig was operating engineer at Laurel prior to his promotion. He has had training in all phases of wireline services in his 3 years with the company.

Formerly an operating engineer with McCullough, Brezny has had extensive oil-field experience as roughneck and driller in the Mid-Continent area. He will work under C. W. Hamilton, northern Texas district sales manager.

Baggett has been with the Baroid Division of National Lead Co. for the past 3 years in sales engineering.

ADVERTISERS IN THIS ISSUE

Aero Design and Engineering Company 39
Aldrich Pump Company, The 62
Allied Steel Products Corporation 328
Allis-Chalmers Mfg. Co. 18
Allis-Chalmers Manufacturing Co., Construction Machinery Division 68, 69
Allis Co., The Louis 73
Allison Division of General Motors 73
American Cable Division of American Chain & Cable 50
American Cyanamid Company, Refinery Chemicals Department 32
American Iron & Machine Works Co. Back Cover
American Recording Chart Co. 292
Anderson and Grunskey 344
Armstrong Machine Works 295
Atlas Asbestos Company, Limited 100
Automatic Electric Sales, Limited 179

Baash-Ross Tool Company 25
Baird Mfg. Co. 288
Bakelite Company A Division of Union Carbide and Carbon Corporation 76
Baker Oil Tools, Inc. 92
Bank of Montreal, The 157
Barber Machinery 335
Barco Manufacturing Company 282
Baroid Division, National Lead Company 73, 74
Bechtel Corporation 193
Beech Aircraft Corporation 110
Berry Division, Oliver Iron and Steel Corporation 196
Bethlehem Steel Co. 14
Black, Sivalls & Bryson, Inc. 60
BJ Service, Incorporated 77
BrakeSol, Inc. 252
British Petroleum Company Limited, The 288
Brown Oil Tool, Inc. 12
Buda Division Allis-Chalmers Manufacturing Company 57
Burns Bros. and Denton, Limited 214

Canadian Bank of Commerce, The 232
Carbide and Carbon Chemicals Company, A Division of Union Carbide and Carbon Corporation 24
Cardwell Mfg. Co., Inc. 254, 255
Chain Belt Co. 30
Chicago Bridge & Iron Company 109
City of Calgary 221
City of Edmonton 222
Classified Advertising 312, 313, 314, 315, 316
Coates Field Service, Incorporated 244
Collins Radio Company 168, 169
Colorado Fuel and Iron Corp., Wickwire Spencer Steel Division 63
Columbia - Southern Chemical Corporation, Subsidiary of Pittsburgh Plate Glass Company 271
Consolidated Electro Dynamics Corporation 297
Construction Machinery Companies 296
Continental Motors Corp. 28
Continental Oil Company 67
Continental Supply Co., The 301, 302
Cooper-Bessemer Corp., The 258
Copon Associates 10
Core Laboratories, Inc. 278
Crose Curran, Limited 164
Crossett Chemical Company Division of The Crossett Company 84
Curtiss-Wright Corporation 51

Davey, Paxman & Company, Limited 231
Davison Chemical Company Division of W. R. Grace & Co. 160
Dearborn Chemical Company 61
Dominion Bridge Company Limited 154
Dowell Incorporated 114, 318
Dresser Manufacturing Division 247
Drilling & Service, Inc. 300
Drilling Equipment Mfg. Company 294
du Pont 53, 54, 285
Dutton-Williams Brothers, Limited 204

Edward Valves, Inc. 252
Electro Rust-Proofing Corporation 286
Elgen Corporation, The 299
Elliott Company 65
Enardo Manufacturing Company 188

Ethyl Corporation of Canada, Limited 159
Fairbanks, Morse & Co. 4
First National Bank of Shreveport, The 231
Fisher Governor Company 11
Flint Steel Corporation 270
Fort Worth National Bank, The 91
Franks Division Cabot Shops, Inc. Inside Back Cover
Fuller Company 64
Fulton & Company, R. H. 342

Gairdner and Company, Limited 183
Garrett Corporation, The, AiResearch Industrial Division 18
Gates Rubber Co., The 89
General American Transportation Corporation 90
Girdler Corporation of Canada, Limited 185
Globe Oil Tools Company 250
Goodrich Company, B. F. 5
Government of Alberta, Department of Mines and Minerals 218
Grancell, I. H. 231
Grant Oil Tool Co. 20, 21
Greenshields & Co. 231
Grove Valve and Regulator Company 41
Guiberson Corporation 198

H & M Pipe Beveling Machine Co. 245
Halliburton Oil Well Cementing Co. 15, 287
Hallikainen Instruments 236
Hercules Tool Company 118
Huey & Co., S. E. 244
Hughes Tool Co. 147, 148

Inferno Co., The 291
Ingersoll-Rand 177
Internal Pipeline Maintenance Co. 277
International Nickel Company, Inc., The 94

Jensen Brothers Mfg. Co., Inc. 275
Johnston Pump Company 19
Jones & Laughlin Steel Corporation Supply Division 200

Kaiser Aluminum and Chemical Corp. 8
Kelley Company, Ben F. 291
Kendall Company, The, Polyken Sales Division 29
Kinzbach Tool Co., The 284
Koppers Company, Inc. 95

Lane-Wells Company Inside Front Cover
Leland Electric Company, The 13
Le Roi Division of Westinghouse Air Brake Co. 40
LimiTorque Corporation 66
Link-Belt Company 7
L-O-F Glass Fibers Company 43
Lunkenheimer Co., The 52

Magnet Cove Barium Corp. 267
Majestic Contractors, Limited 222
Mannesmann Tube Company, Limited 153
Manzel Division of Houdaille Industries, Inc. 184
Marathon Corporation 88
Marsh Instrument Co. 272
Martin-Decker Corp. 290
Martin, Manufacturer, John N. 26
Mathieson Chemicals, Olin Mathieson Chemical Corporation 47
Mayo Hotel, The 284
McCullough Tool Company 175
Mercantile National Bank 264
Mercoid Corp., The 259
Mid-Continent Supply Company 36
Midwest Piping Company, Inc. 37
Midwestern Pipeline Products Company 244
Miller Sand Pump Co. 284
Mission Mfg. Company 256
Moore Corporation, Lee C. 113
Mountain Iron and Supply Company 33
Mueller Co. 49
Murphy Manufacturer, Frank W. 288

Nash Engineering Co. 46
Nelson Electric Mfg. Co. 236
Norris Manufacturer, Inc., W. C. 182

Oakite Products, Inc. 239
Ohio Injector Company 17
Oil Well Supply Division 6
Olin Mathieson Chemical Corporation, Industrial Chemicals Division 47
Oliver Corporation, The 9
Oliver Iron and Steel Corporation, Berry Division 196

Pacific Coast Borax Co. 81
Paris Distributor, Inc., Henry H. 293
Parkersburg Rig & Reel Co. 42, 43
Parsons Company, The Ralph M. 120
Peerless Supply Co., Inc. 288
Petreco A Division of Petrolite Corporation 249
Petro-Chem Development Co., Inc. 237
Petroleum Distributing Co. 252
Petroleum Mechanical Development Company 251
Pfizer and Company, Incorporated, Chas. 83
Philadelphia Gear Works, Inc. 68
Pipeline Anode Corporation 248
Pittsburgh Coke and Chemical Company 20
Polyken Sales Division, The Kendall Co. 29
Powell Valves 70
Procon Incorporated 281
Products Research Service, Inc. 284

Radiomarine Corporation of America, A Service of Radio Corporation of America 230
Raybestos-Manhattan, Inc., Packing Div. 233
Rector Well Equipment Co., Inc. 266
Refinery Engineering Limited 189
Refinery Supply Co., The 227
Reliance Electric and Engineering Co. 165
Republic Steel Corporation 86, 87
Ridge Tool Company, The 290
Robbins & Myers, Inc. 269
Rockwood Sprinkler Company 53
Roebling's Sons Company, John A. 54
Roper Corporation, Geo. D. 280
Royal Bank of Canada, The 150, 151
Royalite Oil Company, Limited 228

Security Engineering Div. 38
Sikorsky Aircraft 82, 83
Socony Mobil Oil Company, Incorporated 238
Solar Aircraft Company 34
Southern California Oil Tool Company 230
Southern Mill & Mfg. Co. 276
Stearns-Roger Mfg. Co., The 170

Tapecoat Company, The 244
Technical Oil Tool Corporation 213
Thermoid Company 44
Thomas Flexible Coupling Co. 265
Thompson Tank & Manufacturing Co., Inc. 264
Timken Roller Bearing Company Steel and Tube Division 73
Tretolite Company A Division of Petrolite Corporation 161
Tube Turns, Inc. 215, 216
Tulsa Paper Company 280

United States Steel Corporation—Oil Well Supply Division 6
United Supply & Manufacturing Co. 274

Valley Electric Corp. 235
Vapor Recovery Systems Co., The 289
Visco Products Co., Inc. 117
Vogt Machine Co., Henry 45

Wallace & Tiernan Products, Inc. 286
Waukesha Motor Company 253
Weatherford Oil Tool Company 200
Welex of Canada, Limited, A Subsidiary of Welex Jet Services, Incorporated 172
Well Equipment Mfg. Corp. 263
Western Supply Company 80
Wheatland Tube Company 79
White Diesel Engine Division 58, 59
Williams Brothers 208
Willis Oil Tool Company 180
Wills, Bickle and Company 230
Willys Motors, Inc. 27
Wilson Supply Company 71
Winslow Engineering Company 23
Wisconsin Motor Corporation 248

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 3,061.71 acres of land in fifteen parcels within the known geologic structure of certain fields in Eddy, Lea and San Juan Counties, New Mexico, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, October 16, 1956, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. Douglas E. Henriques, Manager.

Dowell engineers use modern equipment to clean up pay zone with Mud Acid before a fracturing job.

Mud Acid clears the way for fracturing

Mud-caked formation surfaces can balk every fracturing effort, resisting the passage of fluids and causing excessive treating pressures.

Dowell engineers have a solution to many such problems—a spearhead of Mud Acid. With its mixture of hydrochloric and hydrofluoric acids, Mud Acid is designed to dissolve clay minerals and to prevent the swelling of bentonitic materials. It also dissolves any material soluble in hydrochloric acid, such as limestones and dolomites.

When Mud Acid has done its work, fracturing fluids are able to enter the formation at lower pressures and increased injection rates can be obtained. Mud Acid contains a Dowell inhibitor to help protect well equipment from acid corrosion, even at temperatures above 300°F. Special additives help prevent emulsions.

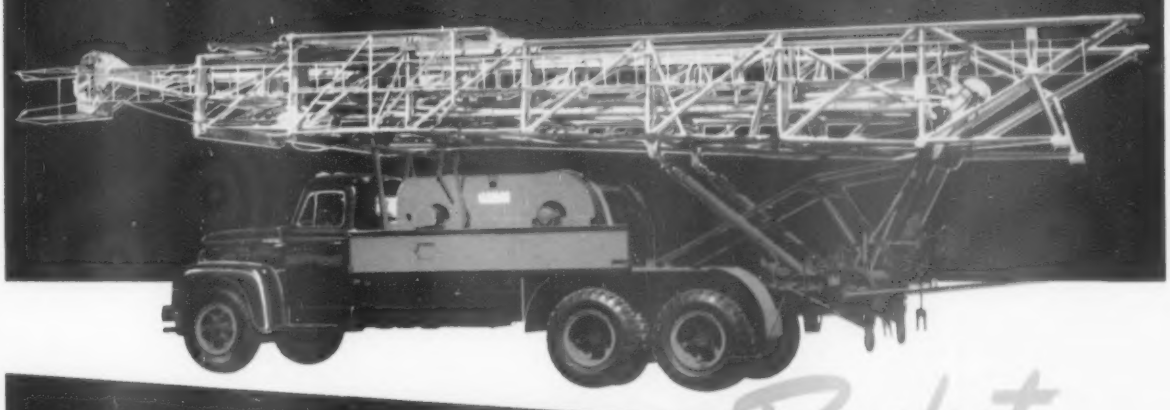
For more information or service, call any of the 165 Dowell offices in the United States and Canada; in Venezuela, contact United Oilwell Service. Or write to Dowell Incorporated, Tulsa 1, Oklahoma, Dept. H-11.

services for the oil industry DOWELL

A SERVICE SUBSIDIARY OF THE DOW CHEMICAL COMPANY

move FASTER

. . . AND GET ON PAYING JOBS *FASTER*



with a FRANKS *Rocket*

Because . . .

Franks Rockets make faster location-to-location moving, strung up. With this, plus faster rig-up and down (no guying to ground required), contractors get on paying jobs faster with Rockets.

Because . . .

Franks Rockets using air lift rod transfer actually pull rods and tubing faster and protect rods from excessive wear and tear.

Because . . .

superintendents request their use and consequently Franks units spend less idle time in yards.

IT WILL PAY YOU TO CHECK FRANKS ROCKETS BEFORE YOU BUY

Only Franks offers "on the spot" field service with stock of parts and factory-trained personnel at: Alice, Compton, Casper, Farmington, Great Bend, Houston, Kilgore, Odessa, Seminole, Edmonton and Tulsa.

FRANKS DIVISION
Cabot Shops, Inc.
Box 3218, Whittier Station
TULSA, OKLAHOMA

FRANKS
DIVISION CABOT SHOPS INC
WELL SERVICING AND DRILLING UNITS
TULSA, OKLAHOMA

"ON THE SPOT" FIELD SERVICE

CABOT
SHOPS, INC.

AMERICAN IRON

Hydra-Cushion

VALVES & SEATS

AMERICAN IRON & MACHINE WORKS CO. INC. — MANUFACTURERS OF OILFIELD EQUIPMENT — OKLAHOMA CITY

with MORE SUPPORT than any other valve!

The three-web design permits full fluid flow through the seat, without increasing velocity of the fluid . . . assuring full loading of mud chambers. Webs act as a positive seat for valve, giving full support from below.

When valve is fully seated, the mushroom top of valve seat gives 360° support to the inside top cylindrical section of valve, assuring even distribution of weight and pressure on seat.

Since mushroom on valve seat projects above the top of seat, far more support is given to the stem on the valve. This assures that valve will open and close with a minimum of wobble.

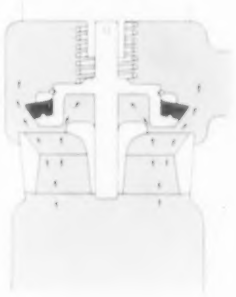
On downward stroke of valve, the compound 808 insert seats first, before tapered metal section of valve contacts seat. After insert has seated and pressure increases, the taper on valve and seat mate, giving 360° metal to metal support.

AVAILABLE THROUGH YOUR LOCAL SUPPLY STORE

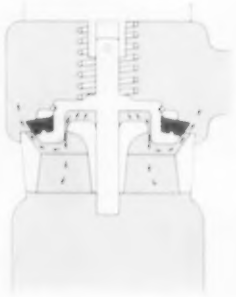
AMF — PETROLEUM EQUIPMENT

AMERICAN IRON & MACHINE WORKS COMPANY, INC.
518 North Indiana Avenue • Oklahoma City, Oklahoma
Subsidiary of AMERICAN MACHINE & FOUNDRY COMPANY

with HYDRAULIC CUSHION ACTION



1 Above diagram shows the valve in fully opened position . . . mud has filled the chamber and also the cylindrical area of the valve.



2 As the valve starts to close . . . mud, which is trapped in the cylindrical area of the valve, is squeezed out around the restricted area between the mushroom and the valve.

3 As the valve nears fully-seated position . . . rubber insert contacts seat first and, as mud is entirely squeezed from between the valve and mushroom on the seat, shock is cushioned and the valve fully seats, with no excessive pounding.